DOCUMENT RESUME

ED 344 509 HE 025 406

TITLE Contingent Repayment Student Assistance Plans. An Outline of Policy Options.
INSTITUTION Council of Ontario Universities, Toronto.
REPORT NO ISBN-0-88799-270-6
PUB DATE Mar 92
NOTE 82p.
AVAILABLE FROM Council of Ontario Universities, 444 Yonge Street, Suite 203, Toronto, Ontario M5B 2T4, Canada. Copies of the computer program, on diskette, are also available.
PUB TYPE Reports - Evaluative/Feasibility (142)

EDRS PRICE MF01 Plus Postage. PC Not Available from EDRS.
DESCRIPTORS College Students; *Computer Simulation; Computer Software; Financial Policy; Higher Education; *Income Contingent Loans; Loan Repayment; Models; *Policy Formation; Student Financial Aid; Student Loan Programs
IDENTIFIERS *Ontario

ABSTRACT

This document on contingent student assistance repayment plans in Ontario universities contains a paper on policy options for repayment plans and the manual for a simulation model for testing policy options. The policy options paper begins by describing the contingent repayment concept in which the test for receiving a public subsidy is shifted from the student's parents to the student-as-graduate. This description covers essential elements, other features, advantages, disadvantages, and the differences between this concept and the "graduate tax." There follows a discussion of options for designing a contingent repayment program with options treated in four groups: those affecting the outflow of funds; those affecting the inflow of funds; the amount of public subsidy to the program; and the administrative structure of the program. The paper concludes that a simulation model is necessary in order to calculate the effects of alternative sets of parameters. An appendix outlines simulation model and data requirements. The document's second part presents the simulation model designed for use on a personal computer. It explains the structure of the model, policy options, policy default values and enrollment data, income data and how to run the programs. Appendixes contain tables and default values and options. Fifty four references are included with the first paper. (JB)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED344509

CONTINGENT REPAYMENT STUDENT ASSISTANCE PLANS

"PERMISSION TO REPRODUCE THIS MATERIAL IN **OTHER THAN PAPER COPY** HAS BEEN GRANTED BY

Council of Ontario Universities

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

406

COUNCIL OF ONTARIO UNIVERSITIES

CONSEIL DES UNIVERSITÉS DE L'ONTARIO

BEST COPY AVAILABLE

CONTINGENT REPAYMENT

STUDENT ASSISTANCE PLANS

Council of Ontario Universities
Conseil des Universités de l'Ontario
444 Yonge Street
Suite 203
Toronto, Ontario M5B 2H4

March 1992

92-1

ISBN 0 - 88799 - 270 - 6

Explanatory Note

In the summer of 1991, the Council of Ontario Universities invited its Secretariat to prepare a discussion paper on the policy options it might consider in the development of a proposal for an income contingent repayment plan for the provision of financial assistance to students at Ontario universities. A small task force was struck comprising Edward DesRosiers, Director of Research at COU, Derek Jamieson, Director of Institutional Analysis and Planning at the University of Guelph, Dan Lang, Assistant Vice-President and Director of Planning at the University of Toronto and David Stager, Professor of Economics at the University of Toronto.

A paper entitled *Contingent Repayment Student Assistance Plans: An Outline of Policy Options* was prepared for COU's October meeting. A copy of the paper is attached as Part I of the present report.

Council's discussion concluded with the recommendation that a simulation model should be constructed which would allow users to estimate the financial requirements of various alternative policy options. In subsequent discussion, the Ministry of Colleges and Universities agreed to share the costs of developing the simulation model and Martin Hicks, Chief Analyst with the College Affairs Branch of MCU joined the members of the original task force to form a steering committee to oversee the project. David Stager was invited to develop the model on Council's behalf.

Professor Stager, with the assistance of Dan Derkach, a programming consultant at the University of Toronto, has prepared a manual entitled *Simulation Model for Contingent Repayment Student Assistance Plans*, a copy of which is attached as Part II of the present report. The manual describes a simulation model, designed for the personal computer, which allows the lay user to test alternative policy options. Copies of the actual computer programme, on diskette, are available upon request from COU.

1992 03 09

CONTENTS

PART I - AN OUTLINE OF POLICY OPTIONS

The Contingent Repayment Concept 1
- Essential Elements
- Features
- Advantages
- Criticisms
- Graduate Tax

Policy Options in Designing a Contingent Repayment Program 5

A. Outflow of Funds 5
- Residency and Citizenship
- Postsecondary Educational Institutions
- Level of Study
- Registration Status
- Amount Available
- Loan Ceilings
- Impact on Outflow of Funds

B. Inflow of Funds 7
- Interest Rate
- Annual Payment
- Length of Repayment Period
- Income Threshold

C. Subsidy 10

D. Administrative Arrangements 11
- Jurisdiction
- Sources of Finance
- Integration with Existing Programs

E. Conclusion 12

Appendix: Simulation Model and Data Requirements 14

Outflow of Funds 15
- Enrolments
- Academic Expenses

Inflow of Funds 16
Labour Force Participants
Earnings

References 18

PART II - SIMULATION MODEL

Introduction 1

Structure of the Model 2

Flow of Funds
Output from the Model

Policy Options 5

Policy Default Values and Enrolment Data 9

Income Data 16

Data for UNIVersity and COLLEGE Programs
Data for the DECILES Program

Running the Computer Programs 22

The Programs
Output Tables

Appendix A: Tables 34

Appendix B: Default Values and Options 46

Part I

CONTINGENT REPAYMENT STUDENT ASSISTANCE PLANS:

An Outline of Policy Options

Council of Ontario Universities
Conseil des Universités de l'Ontario
444 Yonge Street
Suite 203
Toronto, Ontario
M5B 2T4

September 1991

THE CONTINGENT REPAYMENT CONCEPT

Essential Elements

The essential elements in contingent repayment student assistance programs are that: 1) repayment of financial assistance is determined by the student's future income level; and 2) any student at an accredited institution would be eligible for financial assistance without regard to the financial means of the student or his/her parents. In other words, the means test for receiving a public subsidy is shifted from the student's parents to the student-as-graduate.

Contingent repayment programs have usually been proposed as a method for financing an increase in tuition fees, but there is no logical necessity for this association of ideas. Rather, any fee increase could and has been accommodated within conventional student assistance programs; alternatively, a contingent repayment program could be introduced at any time, whether or not there was an increase in fees.

Features

A contingent repayment assistance program would likely include the following general features:

1. Any eligible student could receive a loan equal to part or all of the educational costs, as defined by the program.

2. A student's loan would state the conditions of repayment, including the percentage of annual income to be paid, the maximum number of years during which payments would be required, and the interest rate to be applied to the amount borrowed.

3. An individual who, because of low earnings, had not repaid an amount equal to principal plus accumulated interest by the end of the repayment period (say 25 or 30 years) would not be required to make further payments.

4. Payments would not be required until an individual's income reached a certain level.

5. The program could be administered by a non-profit, government-sponsored agency that would establish a fund from which it made loans directly to students. Funds would be raised initially through government

borrowing or by borrowing directly from pension funds; later, the major source of funding would be the payments received from graduates.

6. These features could be varied to make the program self-financing; more likely, there would be some degree of public subsidy.

Advantages

1. The primary advantage of contingent repayment plans is that the means test is shifted from the students' parents to the students themselves as graduates. This overcomes much of the inequity for which the current assistance plans have been criticized.

2. Contingent repayment plans can be viewed as an arrangement whereby a given generation finances a significant portion its own postsecondary education rather than relying on parental support and the political willingness or taxability of the preceding generation - and rather than having to finance the following generation. This aspect is of considerable importance where there are major demographic changes such as the postwar baby boom or the subsequent sharp decline in birth rates.

3. One of the most important implications of the program would be that any risk in this method of borrowing would be borne collectively by taxpayers rather than by individual graduates. However, taxpayers would realize this risk only to the extent that graduates have incomes far below those of their peers.

   With fixed-debt schemes, a graduate bears the risk because he/she is responsible for full repayment of a loan regardless of the graduate's income. While the large majority of graduates could manage repayment of their loans, many students may be daunted by prospects of a fixed-debt burden since there is such uncertainty about their individual future earnings.

Criticisms

Certain criticisms have also been directed at the proposed scheme:

1. The fear has been expressed that students would hesitate to take on a repayment 'burden' lasting for twenty or thirty years. But the distinction between a contingent repayment plan and a fixed-debt plan must be

made clear: unlike fixed-debt obligations that require fixed payments at fixed intervals, the contingent repayment system allows for low or irregular payments in response to low or irregular incomes. Although a certain principal amount plus interest would be associated with each borrower, any unpaid balance at the end of the repayment period would be forgiven. This amount is the public subsidy that would replace the subsidy in current grant and loan programs.

2. There is also a concern that the program would require larger public subsidies than the current schemes because a few graduates would never have any income and, for many, their incomes would be insufficient to result in complete repayment. But university and college graduates have the highest labour force participation rates and the highest income levels. (The labour force participation rate for university graduates aged 25 - 44 years in Ontario is 98 per cent for males and 86 per cent for females. The employment income of university graduates in Ontario in 1989 was almost double the average for the rest of the Ontario labour force.) Moreover, a simulation model of any proposed program would enable policy-makers to determine alternative combinations of parameters that would result in whatever degree of public subsidy that might be intended. It should also be noted that the current programs do not enquire why parents have low incomes; similarly, low-income graduates should be eligible for subsidy without regard to the reasons for their low incomes.

3. Some faculty and student organizations have been critical of this program because it has been associated with proposals for fee increases, but there is no necessary connection between these two policy initiatives. Their criticisms of these proposals also assume that increased funding could be forthcoming from government, but this assumption is increasingly invalid in virtually all jurisdictions.

4. The most significant concern expressed is how large the fund would be and how it would be financed, especially in the initial phase. These questions should be addressed first by testing several sets of policy parameters in a simulation model to determine the conditions under which the fund would make a manageable demand on bond financing. Pension funds are an obvious source of financing because they reflect demographic and economic cycles that parallel the demand for student financing, and because repayments from graduates through the tax system represent a long-term, low-risk investment that suits the pension funds.

5. It is sometimes assumed that such a program necessarily must be implemented at the federal or interprovincial level, if only because payments would be collected through Revenue Canada's tax system and because Ontario graduates would be employed in other provinces. But payments from Ontario residents would require only a small addition to the Ontario version of the tax return, and out-of-province graduates could be followed through the national records.

Graduate Tax

Contingent repayment plans are sometimes confused with proposals for a 'graduate tax'. This latter proposal differs fundamentally from a contingent repayment loan scheme because no repayable principal would be specified. Such a tax would be an additional levy on incomes of graduates from postsecondary institutions, but it would not be related to any specific loan or imputed fees. Rather, the tax would be used to increase the state's general revenue by a contribution from graduates who had earlier received subsidies through the state support of educational institutions, and the levy would continue for the life of the graduate, or until a subsequent government rescinded the graduate tax.

POLICY OPTIONS IN DESIGNING A CONTINGENT REPAYMENT PROGRAM

Several policy options would determine the major parameters of a contingent repayment program. Decisions on these options would be influenced by what is 'fair and reasonable', the effect of each choice on the total outflow or inflow of funds, and the intended scope or coverage of the program.

The options can be treated in four groups: those affecting the outflow of funds; those affecting the inflow of funds; the amount of public subsidy to the program; and the administrative structure of the program.

The net flows could be allowed to determine the size of the subsidy; or alternatively, a certain subsidy level could constrain the choices affecting the flow of funds. In practical terms, these two approaches would be integrated in difficult political decisions.

It is assumed in the following discussion that a contingent repayment program would be available only to Ontario residents, but a more broadly based program could also be designed.

A. Outflow of Funds

The total outflow of funds would be determined by two sets of policy parameters: the number of eligible borrowers and the amount that can be borrowed.

Residency and Citizenship

A loan program sponsored by the Ontario government might be available only to Ontario residents, but out-of-province residents attending Ontario institutions could also be included because their repayments could be processed through the income tax system. Visa students would not be eligible because, as such, they would not be employed in Canada following graduation and their payments could not be collected through the Canadian income tax system.

Postsecondary Educational Institutions

There are four different decisions to be made with respect to institutions that would fall within the scope of the program. Would eligibility be extended to:

1. Ontario residents at both universities and community colleges, or only at universities?

2. Ontario residents at all accredited postsecondary institutions in Canada, or only to Ontario institutions?

3. Ontario residents at private institutions and at institutions outside Canada?

4. Non-residents who are at Ontario postsecondary institutions?

Level of Study

The program could be available only to students at the undergraduate level, or it could be extended to include students in professional faculties and graduate programs.

Registration Status

Eligibility for the program might be restricted to students registered in a full-time program of study (as defined either by each institution or by the administering agency), or be open also to part-time students.

Amount Available

The total amount that could be borrowed each semester could be limited to a specific amount (regardless of educational program), or to some fraction of the tuition fee, the full fee, the fee plus other academic expenses (books, supplies, accommodation and travel), or the fee plus both direct and indirect costs (including net forgone earnings).

There may be some reason to cap the total amount that a student could borrow over the duration of his/her program(s) of study, but it is not obvious that this should be the case. Longer and more expensive programs are generally associated with higher earnings for the graduates of these programs, notably medicine, dentistry, and law. (While graduates from Ph.D. programs may not realize higher earnings as a result of such studies, students in these programs are supported by a variety of fellowships and assistantships that reduce the need for borrowed funds.)

Impact on Outflow of Funds

Alternative decisions on each of the foregoing policy options would result in widely differing financial requirements for the program. Rough approximations of the annual financial outflows are provided below for three different cases to illustrate the impact of alternative parameters, based on 1989-90 data.

Borrowers	Amount Allowed	Total Amount ($ million)
Full-time Ontario undergraduates at Ontario universities	Tuition fee	$ 290
Full-time Ontario undergraduates at Ontario universities and CAATs	Tuition fee	$ 350
Full-time Ontario undergraduates at Ontario universities and CAATs	Tuition fee plus direct academic expense (books, accomm., travel)	$1,120

B. Inflow of Funds

The parameters or options affecting the inflow of funds, or repayments, would seem to offer more scope for policy deliberation than the options affecting the outflows. The outflow would be based on potential borrowers and the amount available; these would likely be defined in a manner comparable to the Canada Student Loans Program. The only significant flexibility might be with respect to part-time students, or students at foreign institutions. The inflow of payments, however, is dependent on a wide range of alternative policy decisions. Moreover, when the outflow parameters are set, the alternative repayment conditions will determine the total subsidy required; that is, the difference between the amount borrowed and the amount repaid by each cohort of students.

Although the term 'graduates' is used in this section, it includes all borrowers, whether they failed, withdrew, or were graduated. All persons who borrowed from the program, whether or not they completed their studies, would be expected to make repayments. (It should be obvious that drop-outs cannot be exempted from repayment because this would result in many students refusing formal graduation and obtaining a certificate or transcript indicating completion of degree requirements.)

The three principal parameters on the repayment side are the interest rate, the annual payment required, and the length of repayment period. In addition, there may be a threshold income level below which payments would not be required.

Interest Rate

The amount borrowed could be adjusted annually by a certain interest rate, or by the inflation rate. The latter option would entail a subsidy equal to the real rate of interest. (The real rate of interest is the actual or nominal interest rate for three-month treasury bills less the inflation rate. The real rate has averaged about 3 per cent over the past two decades.) The inflation rate (based on the Consumer Price Index) could be differentiated by region or metropolitan area and could be calculated with or without food and energy prices, but the all-items price index for Canada is commonly used for purposes of this kind.

If the principal amount were adjusted by an interest rate, a specific rate would be set for each cohort, but it could also be revised, even semi-annually or annually. The rate could be either the same as or higher than the rate paid on funds borrowed to finance the program. Since there would normally be a gap of at least five percentage points between the rate at which the fund could borrow and the rate on personal loans, there is a significant range within which the fund could charge a rate greater than its borrowing rate yet offer a rate that would be less than the rate available to student borrowers at other lending institutions. Unlike the existing student loan plans, the interest rate would be applied from the time of borrowing rather than commence after graduation.

Annual Payment

The amount paid annually by a graduate would depend on the definition of income used by the program and the percentage of income required. In the pure theory of income-contingent repayment schemes, the relevant measure of income is the additional earnings attributable to further education. But since this is an impractical measure, and because repayments are made through the income tax system, a definition of income used on the individual tax return should be used in this program. Assessed income or net income could be used, but taxable income would more closely represent an individual's ability to pay. Although this would include investment and other income, these are small components (about five per cent on average) of total income. Moreover, persons who have no employment income but high investment income could not escape repayment if an all-income measure is used.

The annual payment to the fund could be related to the amount borrowed as well as to the level of income. For example, the payment might be calculated as a certain percentage of taxable income per $1,000 borrowed. Alternatively, the payment might be a certain percentage of taxable income regardless of amount borrowed and level of income. Or the percentage might increase as taxable income increased - thus reinforcing the progressive tax structure.

Length of Repayment Period

Unless it were intended that this program would provide a substantial subsidy to graduates, the program would be designed so that a substantial majority of the graduates would repay the amount borrowed plus interest over a period of about twenty years. There may be a specified period, however, after which payments would not be required. This might be twenty to thirty years following graduation or other termination of formal education.

Income Threshold

In order to emphasize the ability-to-pay feature of a contingent repayment plan, and to gain greater political support, it may be desirable to include an income threshold below which payments would not be required. This threshold should be expressed in terms that are easily understood and measured, such as the average gross income for the total labour force. A further policy question, however, would be whether this threshold should be defined for each age group and gender.

Repayments might be calculated as a percentage of one's taxable income that exceeded this threshold level. But revenue to the fund would be much greater if the threshold level was used only to determine whether or not a payment was required, and repayment was based on the total taxable income. There may be some concern that individuals with widely fluctuating incomes - entertainment and sports celebrities, and creative and performing artists - might gain unintended advantage by the threshold provision, but the longer the specified repayment period, the less will be the effect of fluctuating incomes.

There may also be some objection to the threshold concept, but the majority of university graduates, and many community college graduates, would earn more than the average income of the total labour force soon after graduation. The threshold concept serves mainly to take account of persons with low or zero income, particularly women who withdraw from the labour force for short periods for childbirth and child-rearing. It also serves to provide a 'grace period'

of one to five years following graduation or withdrawal that would be easier to administer than a specific number of calendar years.

It may be argued that persons whose incomes are just below the threshold level will curtail employment in order to avoid crossing the threshold. This argument is made with respect to many similar taxation situations, including the progressive marginal tax rates, but there is little empirical evidence of this effect.

The very approximate effect of these parameters can be estimated by using data from the 1986 Census. The average male university graduate in Ontario would reach the income threshold (defined as the labour force average income) at about age 28. If the annual repayment rate were set at 3 per cent of taxable income and the outstanding principal amount were adjusted by the rate of wage inflation, it would take about twenty years for the graduate to repay an amount equal to four years of tuition fees plus direct academic expenses (books, accommodation, travel). If the amount borrowed were only the tuition fee for four years, repayment could be completed in about eight years. But it must be emphasized that these repayment periods depend on the interaction of the threshold income, the annual repayment required, and the interest rate. For example, increasing the annual payment to 4 per cent of taxable income would shorten the repayment period to about 16 and 6 years in the above examples.

C. Subsidy

Perhaps the basic policy issue concerns the degree of subsidy to the program, where subsidy is defined as the difference between payments out of and into the fund for each cohort of students. How would a subsidy be incorporated in the program? What is the rationale for a subsidy? What modification would be made to the structure of the program, as defined by the parameters described above, to achieve the desired level of subsidy?

The fund could be designed to be self-financing but this would require that higher-income graduates pay more into the fund than the principal and accumulated interest in order to offset the incomplete repayments from low-income graduates. This arrangement could result in non-participation in the fund by a large number of students who expected to have high incomes and who had access to private funding. But if the contingent repayment program is replacing existing programs, the subsidy from the latter might be applied to the new program. This approach would provide at least an initial constraint on the values attached to the other parameters.

D. Administrative Arrangements

There are at least three policy issues with respect to the administration of an assistance program: jurisdiction, financing, and integration with existing assistance programs.

Jurisdiction

It has been assumed in this paper that a contingent repayment assistance program would be implemented by the Ontario government for the benefit of Ontario residents, but this assumption raises the question whether such a program should be implemented and administered by the Ontario government, the federal government, the federal and provincial governments, some or all of the provincial governments, a provincial or national grouping of postsecondary institutions, or an independent, non-profit agency that could incorporate changes in or combinations of these alternative sponsors.

Sources of Finance

Financing for a contingent repayment program would differ for the initial and the established stages of the program. In both cases, the total funding required would depend on the coverage of the program as determined by the parameters listed above in the section on fund outflows. But these parameters could be set during the initial decade of the program such that the funding requirements were minimized. For example, during the first phase of the program, it could be restricted to full-time, first-year undergraduates, who could borrow the amount of their tuition fees. Gradually, the eligibility and available amount could be increased to achieve the program structure ultimately intended by the policy-makers. The rate at which this enlargement occurred would depend on the rate of repayments to the fund and any phasing of financial support that is arranged with sponsoring governments.

The required financing could be provided by government borrowing, but it could also be provided by borrowing from the private sector (especially insurance companies and pension funds) with government guarantees. This would make funds available at a lower rate, without adding to governments' own debt.

Some universities may also be persuaded to invest their own financial assets in such a program. This is the basis for Yale University's deferred tuition program that was introduced in the 1970s.

Finally, a substantial contribution to the fund in its inaugural years could be raised by placing a special levy on corporate profits. This might meet less resistance than other proposals for corporate taxes since it would be applied for a limited period and would recognized as a contribution to improving the financing of postsecondary education.

Integration with Existing Programs

In the early stages of a contingent repayment program, existing student aid programs would be continued in order to provide the full amount of assistance required. The substantial policy question in this area, however, is the extent to which means-tested assistance programs would continue to co-exist with a program that was not related to parental income. To the extent that the means-tested programs are ineffective and inequitable, it would seem preferable to move as quickly as possible to reallocate the subsidies in those programs to the contingent repayment programs.

E. Conclusion

The foregoing set of policy options has described several alternative decisions that would be required to define a contingent repayment student assistance program. In the initial stages, a program that could be administratively workable and politically feasible would include all Ontario residents (and bona fide refugees) registered as full-time students in undergraduate and second-entry professional programs (medicine, law, business, education, etc.) at Ontario universities, colleges of applied arts and technology, and other provincially-sponsored postsecondary institutions. These students would be able to borrow an amount equal to the tuition fee and other compulsory fees. To include other student categories, such as part-time students, graduate students, and out-of-province students, would raise more complex administrative issues; these groups could be incorporated gradually at a later stage.

Other alternative options in coverage of institutions, students, and students' expenses could also be considered following more experience with the administration and financing of the program.

If only the tuition and other fees were covered in the initial stage, Ontario grants and Canada loans would continue to provide assistance for other direct expenses. The reduced demand on these programs would, however, provide funds that could be reallocated to the new program.

Since the amount of the subsidy to the program likely would be a primary policy decision, the parameters on the inflow of funds - interest rate , annual repayment rate, repayment period, and threshold level of income - would be constrained. In order to determine the financial requirements under alternative decisions on each of the options, a simulation model should be constructed to calculate the effects of alternative sets of parameters.

The simulation model would calculate the payments out of and into the fund for each fiscal year to show the net financial flow for each year, and thus the amount of external financing that would be required under alternative sets of parameters. The total outflows and inflows, and thus the value of the subsidy, could also be calculated for each cohort of students; that is, each group of students entering postsecondary education in a given year. The model should be designed to follow each cohort through the years of schooling (fund outflows) and employment (fund inflows), and then aggregate the flows for each calendar year.

A model of this kind would serve as more than a once-only tool for assessing alternative policy decisions. Rather, it could be used in rudimentary form in the early development of a contingent repayment program and then be modified and expanded over time as a continuing tool for policy evaluation and development.

APPENDIX: Simulation Model and Data Requirements

The simulation model would calculate the payments out of and into the fund for each fiscal year. This would show the net financial flow for each year, and thus the amount of external financing that would be required under a wide range of alternative sets of parameters. The total outflows and inflows, and thus the value of the subsidy, could also be calculated for each cohort of students; that is, each group of students entering postsecondary education in a given year. The model should be designed to follow each cohort through the years of schooling (fund outflows) and employment (fund inflows), and then aggregate the flows for each calendar year by summing across the cohorts.

A rate of return can also be calculated for each cohort to show the real interest rate that would need to be charged, given a certain set of parameters, that would allow the fund to break even. (This is the internal rate of return, defined as the discount rate that equates the present values of outflows and inflows.)

Actual data are required for the year the fund would commence to provide a baseline from which projections can be made. These projections should include at least ten years of payment outflows and 30 years of payment inflows. That is, there should be at least ten cohorts enter the system in order to show how the fund would operate and especially to show the sensitivity of the financial flows to alternative assumptions on which the projections are based. Since the projections of enrolments and academic costs and of repayments will depend on several assumptions beyond the policy parameters described above, it is essential that alternative projections be tested in the model.

Values of parameters could be changed for any calendar year of the program, or a scale factor could be included so that the parameter value was changed incrementally through the years. For example, the tuition fee parameter could be increased at specific intervals, or it could be increased at a certain percentage each year.

Estimates of future inflation are not required for the model unless there is a strong case for assuming that inflation rates would differ for different components of the fund inflows and outflows.

NOTE

The following notes describe the optimum detail for data. Where such data are not readily available, aggregate data could be used to illustrate the operation of the model but policy conclusions should take into account the approximate nature of the resulting calculations.

1. Outflow of Funds

It is assumed that all eligible students would participate in the program and that students would borrow the maximum amounts allowed. This assumption is based in turn on the assumption that the program would charge a lower rate of interest than the rate available on personal loans. Some students or their families would have financial assets earning less than the fund would charge but it may be assumed that the difference is too small to affect large amounts of alternative funding.

The assumption of complete participation in the fund could be changed, but this would result in proportionately smaller outflows and inflows, unless borrowers differed from non-borrowers in characteristics that affect the fund flows.

The outflow of funds would be calculated by multiplying the number of persons enroled in each educational category times the amount that could be borrowed in that category.

Enrolments

Data are required for the number of persons (excluding visa students) enroled each semester in each program of study (and at each university and college to the extent that fees and other costs differ by program and institution). Enrolment data must also be disaggregated by gender and age. There may be small variations in academic expenses for these categories, but more important, there will be different earning levels on which repayment calculations will be based.

Comparable enrolment data would be required for part-time students if they were to be included in the program.

In order to track each cohort through educational institutions and into the labour force, data are also required on the average time required for completion of a program of study.

Academic Expenses

Data are required on the tuition fee for each program and level of study at each institution.

Estimates of students' expenditures for books, supplies, and transportation can be obtained from student aid offices at institutions and governments. But these data must take account of special cases, such as the expensive equipment and supplies required by dentistry students.

Estimates of students' expenditures for room and board can be compiled from student surveys and offices, and data on residence fees. Since one of the policy parameters is the extent to which accommodation costs would be included in the available amount for live-at-home students, and since residence accommodation differs by university, data are required on the distribution of students by type of accommodation.

If forgone earnings, or some portion of these, were to be covered by the loan programs, estimates of forgone earnings could be derived from census data on earnings of high school graduates, adjusted for the summer and part-time earnings of the student borrowers.

2. Inflow of Funds

Calculations of the inflow of funds are more complex and less certain than for the outflows. The repayments would depend on the number of persons from each cohort of students who were in the labour force each year, the earnings level associated with each category of earners, together with the policy parameters described in the preceding section.

Each category of individuals, defined by both the input and output parameters, must be followed year-by-year through the simulation so that the model can determine when the total repayments equal the total debt. When that point is reached, the category of individuals is flagged and no further payments are calculated for that group.

Labour Force Participants

Projections are required for the number of persons who would be in the labour force each year, from each cohort of students, disaggregated by age, gender, program of study and institution, and by completion or non-completion of the study program. This requires that each cohort of students must be adjusted for the following: the probability of completing the various programs of studies; labour force participation rates by age, gender, and marital status; mortality rates by age and gender (since no payments are required on behalf of deceased persons); and marriage, separation, and divorce rates by age and gender.

Unemployment rates are taken into account implicitly in the average earnings for each category.

Earnings

Projections of graduates' average earnings are required, preferably by decile or quartile to reflect income variation, by program and level of study, by age and gender. These would be derived from census data that could be used to construct age-earnings profiles for each graduate category, and would be adjusted for alternative assumptions about real growth in earnings.

If repayments are to be based on taxable or net income, consideration might be given to any policy changes that might affect these, but this would be a low priority in the simulation exercises.

REFERENCES

Ahamad, B., R. Rowley and M. Wisenthal. Estimating the Financial Requirements of an Income Contingent Repayment Student Assistance Plan for Canada. Ottawa: Commission of Inquiry on Canadian University Education, Association of Universities and Colleges of Canada.

Association of Universities and Colleges of Canada. 1980. Ad Hoc Committee on Student Assistance. Brief presented to the Federal-Provincial Task Force on Student Assistance. Ottawa: AUCC (mimeo).

Atkinson, G.B.J. 1983. Student loans. Journal of Further and Higher Education, 7(1), 47-53.

Australia. 1988a. (Wran) Committee on Higher Education Funding. Report. Canberra: Australian Government Publication Service.

____. 1988b. House of Representatives. Higher Education Funding Bill. Canberra: Commonwealth Government Printer.

Canada. 1985. Royal Commission on the Economic Union and Development Prospects for Canada. Report. Toronto: University of Toronto Press.

____. 1986. Task Force on Program Review. Services to the Public: Education and Research. Ottawa: Supply and Service Canada.

____. 1987. Senate Standing Committee on National Finance. Federal Policy on Postsecondary Education: Report. Ottawa: Supply and Services Canada.

Chapman, B.J., and T.T. Chia. 1989. Financing higher education: private rates of return and externalities in the context of the tertiary tax. Discussion paper no. 213. Canberra: Australia National University, Centre for Economic Policy Research.

Committee of Vice-Chancellors and Principals (CVCP). 1989. Student Support (VC/89/4B). London: The Committee.

Cook, Gail C.A. and David Stager. 1969. Student Financial Assistance Programs. Toronto: Institute for Policy Analysis, University of Toronto.

____. 1970. Student aid: a proposal and its implications. Canadian Tax Journal, 19(6), 558-564.

Crew, M.A. and A. Young. 1977. Paying by Degrees. London: Institute of Economic Affairs.

Dresch, S.P. 1980. Financial and behavioral implications of federal student loan programs and proposals, in H.P. Tuckman and E.L. Whalen (eds.) Subsidies to Higher Education: The Issues. New York: Praeger.

Federal-Provincial Task Force on Student Assistance. 1981. Report. Ottawa: Supply and Services Canada.

Feldman, R. 1976. Some more problems with income-contingent loans: the case of medical education. Journal of Political Economy, 84(6), 1305-1311.

Friedman, Milton. 1955. The role of government in public education, in R.A. Solo (ed.) Economics and the Public Interest. New Brunswick, N.J.: Rutgers University Press, 123-153; revised and reprinted in Capitalism and Freedom. Chicago: University of Chicago Press, 1962; and in M. Friedman and R. Friedman. Free to Choose. New York: HBJ, 1980.

Gladieux, L.F. 1989. The student loan quandary: are there workable alternatives? Change, (May/June), 35-42.

Glennerster, H., Stephen Merrett, and Gail Wilson. 1968. A graduate tax. Higher Education Review, 1(1), 26-38.

Hansen, W.L. and M.S. Rhodes. 1988. Student debt crisis: Are students incurring excessive debt? Economics of Education Review, 7(1), 101-112.

Hartman, Robt. 1971. Credit for College. New York: McGraw-Hill.

____. 1974. Financing the opportunity to enter the 'educated labour market', in M.S. Gordon (ed.) Higher Education and the Labour Market. New York: McGraw-Hill.

Hawke, G.R. 1988. Report on Post-Compulsory Education and Training. Wellington, N.Z.: Department of Education.

Holland, J. and S. Quazi. 1981. Grants and Loans for Students. Ottawa: Secretary of State.

Johnson, A.W. 1985. Giving Greater Point and Purpose to the Federal Financing of Post-Secondary Education and Research in Canada. Ottawa: Secretary of State.

Johnstone, D. Bruce. 1972. New Patterns for College Lending: Income Contingent Loans. New York: Columbia University Press.

____. 1977. Federally sponsored student loans: An overview of issues and policy alternatives, in L.D. Rice (ed.) Student Loans: Problems and Policy Alternatives. New York: C.E.E.B.

____. 1986. Sharing the Costs of Higher Education. New York: College Entrance Examination Board.

Kent, Tom. 1989. Getting Ready for 1999: Ideas for Canada's Politics and Government. Halifax: Institute for Research on Public Policy.

Krucharczyk, John, and Georges Monette. 1981. Student assistance policy and the financing of higher education in Canada, in D.M. Nowlan and Bellaire (eds.) Financing Canadian Universities: For Whom and By Whom? Toronto: OISE Press. 228-242.

Leslie, Peter M. 1980. Canadian Universities 1980 and Beyond: Enrolment, Structural Change and Finance. Ottawa: Association of Universities and Colleges of Canada.

____. 1981. New directions in financing Canadian universities, in D.M. Nowlan and R. Bellaire (eds.) Financing Canadian Universities: For Whom and By Whom? Toronto: OISE Press, 192-207.

Nerlove, M. 1975. Some problems in the use of income-contingent loans for the finance of higher education. Journal of Political Economy, 83(1), 157-183.

New Zealand. 1987. Universities Review Committee (NZURC). New Zealand's Universities: Partners in National Development. Wellington, N.Z.: Vice-Chancellors' Committee.

Nova Scotia. 1985. Royal Commission on Postsecondary Education. Report. Halifax: The Commission.

Ontario. 1984. Commission on the Future Development of Universities in Ontario (CFDUO). Ontario Universities: Options and Futures. Toronto: The Commission.

Reischauer, R. D. 1989. HELP: A student loan program for the twenty-first century, in L.E. Gladieux (ed.) Radical Reform or Incremental Change: Student Loan Policy Alternatives for the Federal Government. New York: The College Board.

Rice, Liis (ed.) 1977. Student Loans: Problems and Policy Alternatives. New York: College Entrance Examination Board.

Shapiro, Edward. 1963. Long-term student loans: A program for repayment according to 'ability to pay'. Harvard Educational Review, 33(2), 186-207.

Shell, K., F.M. Fisher, D.K. Foley and A.F. Friedlander. 1968. The Educational Opportunity Bank: an economic analysis of a contingent repayment loan program for higher education, National Tax Journal, 21(1), 2-45.

Stager, David. 1981a. Federal Involvement in Post-secondary Education for Highly Qualified Labour. Ottawa: Supply and Services Canada.

____. 1984. Accessibility and the Demand for University Education. Toronto: Commission on the Future Development of the Universities of Ontario.

____. 1989. Focus on Fees: Alternative Tuition Fee Policies. Toronto: Council of Ontario Universities.

Sweden. 1988. National Board of Student Aid. Study Assistance in Sweden. Sundsvall: The Board.

Times Higher Education Supplement (THES). 1988a. Debt strategy with honours. T.H.E.S., 8 July.

United Kingdom. 1988. Department of Education and Science. Top-Up Loans for Students. London: HMSO.

United States. 1967. President's Science Advisory Committee. Educational Opportunity Bank, Washington, D.C.: U.S. Government Printing Office.

____. 1969. Department of Health, Education and Welfare. Toward a Long-Range Plan for Federal Financial Support for Higher Education. Washington, D.C.: USGPO.

____. 1973. National Commission on the Financing of Postsecondary Education. Financing Postsecondary Education in the United States. Washington: The Commission.

Vickery, W. 1962. A proposal for student loans, in Selma Mushkin (ed.), Economics of Higher Education, Washington, D.C.: U.S. Office of Education.

West, E.G. 1975. Student Loans: A Reappraisal. Toronto: Ontario Economic Council.

____. 1976. The Yale tuition postponement plan in the mid-seventies. Higher Education, 5(2), 169-176.

____. 1988. Higher Education in Canada: An Analysis. Vancouver: Fraser Institute.

Wolfson, M.C. 1969. CORSAP Simulation Model: User's Manual. Toronto: University of Toronto, Institute for the Quantitative Analysis of Social and Economic Policy.

Part II

SIMULATION MODEL

FOR CONTINGENT REPAYMENT

STUDENT ASSISTANCE PLANS

Prepared for the

Council of Ontario Universities

by

David Stager
Department of Economics
University of Toronto

and

Dan Derkach
University of Toronto

February 1992

INTRODUCTION

The simulation model described in this manual was developed in response to a request from the Council of Ontario Universities for a model that could be used to examine the financial implications of alternative policy options in contingent repayment student assistance programs.

The general framework of the model is based on student assistance programs that include the following features:

1. Eligible students could receive an advance equal to part or all of the educational costs, as defined by the assistance program, from an administrative agency.
2. The advance would be repaid under conditions that include the percentage of annual income to be paid, the maximum number of years during which payments would be required, and the interest rate to be applied to the advance received.
3. Individuals who, because of low income, had not repaid an amount equal to the advance plus accumulated interest by the end of the repayment period would not be required to make further payments.

At least three purposes can be served by the simulation model: 1) to demonstrate by numerical example how an assistance program would function; 2) to provide an estimate of the total financial requirements for a program in terms of the annual borrowing by the assistance fund, the cumulative debt of the assistance fund, the interest subsidy (if any), and the government's cost for forgiven debts; 3) to show the variation in these amounts under alternative data assumptions and policy options.

Questions or suggestions concerning the model's use and interpretation of results can be directed to Dr. David Stager at (416) 978-8626.

STRUCTURE OF THE MODEL

Flow of Funds

The simulation model is constructed to show the outflow of funds from the agency to students, the inflow of funds from graduates to the agency, and the net debt balances for each cohort of students and for all cohorts for each calendar year.

A cohort of students is the total enrolment entering the first academic year at the universities or community colleges. Each cohort is comprised of sub-cohorts defined by gender and academic program. There are 30 sub-cohorts in the university sector and 24 sub-cohorts in the community college sector. These are listed in Table 1. Six of these sub-cohorts are further divided into deciles to examine the effect of the policy options on various income groups.

To fulfil the purposes of the model outlined above, it is sufficient that the model incorporate only the major groups of students that are differentiated by their educational and employment patterns, plus the minor groups whose patterns are sufficiently different to alter the aggregate calculations of the model. The model has not been designed to include all the sub-cohorts in the complex structure of postsecondary education. Such a detailed model would need to treat virtually every student as an individual sub-cohort because students take various combinations of academic programs - often with differing sequences of full- and part-time study, and pursue diverse paths after graduation - including travel, graduate study, prolonged job search, etc.

The annual outflow of funds from the administrative agency is calculated by multiplying the number of students (by gender) in each academic program who would participate in the program times the dollar amount available for each student in that program. These annual

Table 1 Sub-cohorts identified in the model, for each gender

UNIVERSITY SECTOR (30 Sub-cohorts) (15 academic categories x 2 genders)	**COLLEGE SECTOR** (16 Sub-cohorts) (8 academic categories x 2 genders)
Arts and Science Dropouts, first year Dropouts, second year Three-year degree Four-year degree	**Arts, Business Technology** Dropouts One-year diploma Two-year diploma Three-year diploma
Engineering, Architecture Dropouts, first year Dropouts, second year Degree	**Health** Dropouts One-year diploma Two-year diploma Three-year diploma
Other Programs Dropouts, first year Dropouts, second year Degree	
Law Degree	
Medicine Degree	
Masters Degree	
Doctorate Dropouts Degree	

advances to students are accumulated and are increased by compound annual interest to calculate the accumulated debt for each sub-cohort for each calendar year. The net debt outstanding is then calculated as annual payments from graduates are received.

The inflow of funds (or payments from graduates) is based on the estimated average annual income of individuals in each sub-cohort, the income threshold (if any) at which

payments commence, the percentage of annual income required as payment to the program, and the number of years over which payments are required. The number of graduates making payments each year is adjusted for the mortality rate and the labour force participation rate for each gender, age, and education level to calculate the adjusted annual payment per person.

Output from the Model

There are three sets of calculations produced by the simulation model. These are designed so that one can examine: 1) the financial flows over the lifetime of a single cohort or sub-cohort; 2) the aggregate financial flows for each calendar year as successive cohorts enter the program; and 3) the unpaid balances for different income groups within a sub-cohort. These show the important financial balances for each year, namely the cumulative debt of the fund, the net interest subsidy for the fund, and the unpaid balances at the end of the repayment period.

Tables are produced for each sub-cohort to show for each calendar year the value of advances, cumulative advances, repayments, cumulative debt balance, cumulative interest, and annual interest subsidy (if any). The unpaid balance at the end of the repayment period is shown by the final outstanding debt. These amounts are also aggregated across all sub-cohorts to show the totals for the entire cohort.

Tables are also produced for the aggregate of any selected number of successive cohorts, showing for each calendar year the same accounts that are provided for individual sub-cohorts and cohorts.

Because the sub-cohorts selected for disaggregation into deciles are only part of the university or college sectors, aggregate tables are not compiled for these groups.

Sample tables are presented and discussed in the final section of this document.

POLICY OPTIONS

The model includes and makes provision, for each successive cohort, for alternative values assigned to the following policy options:

1. Eligible enrolment, by program and gender

The number of students in each academic program, by gender, who are eligible and who are expected to participate in the assistance program can be varied for each successive cohort. Calculation of the enrolment to be entered for each sub-cohort requires that assumptions be made about the percentage of students who drop out of each academic program at the end of the first and second years, the numbers who graduate with three-year and four-year degrees, the percentages of students who continue to masters and then to doctorate programs, and the percentage who do not complete the graduate program. For example, the enrolment to be entered for the doctoral graduate sub-cohort requires that an entering undergraduate enrolment be reduced by these assumptions about attrition and transition. This is discussed more fully in the next section where the derivation of enrolment data is explained.

The first year of the simulated student assistance program includes only first-year students. This cohort continues in the program as they proceed through the academic years, and are joined by subsequent cohorts.

If an assistance program provides for non-participation by students (i.e., an up-front opt-out provision), the enrolment data would be reduced by the expected non-participation fraction before the data are entered in the model.

2. Amount advanced to students

The amount advanced to students each year is expressed as a specific amount that can be altered for cohorts entering in subsequent years.

3. Interest rate on the advances

The principal amount advanced to students can be incremented annually by a certain interest rate. The rate is set for the lifetime of each cohort, but it can be revised for each subsequent cohort. The interest rate is applied from the time each advance is received by the students and is compounded annually.

4. Threshold income level at which payments begin

Repayments do not be begin until a graduate's income reaches a certain level. This can be specified as any amount equal to or greater than zero.

5. Percentage of income paid to the fund

The annual payment to the fund is calculated as a percentage of taxable income. The percentage can be increased as taxable income increases; and changes can be made in both the income brackets and the related percentages. The percentage can also be set at a single value for all income brackets.

6. Length of repayment period

The period after which no further payments are required can be set at any number of years following the year that the final advance is received, or in the case of masters and doctoral students (who receive no advance in the base model), the year following graduation. For dropouts, the repayment period begins the year after withdrawal.

7. Borrowing Rate for Fund

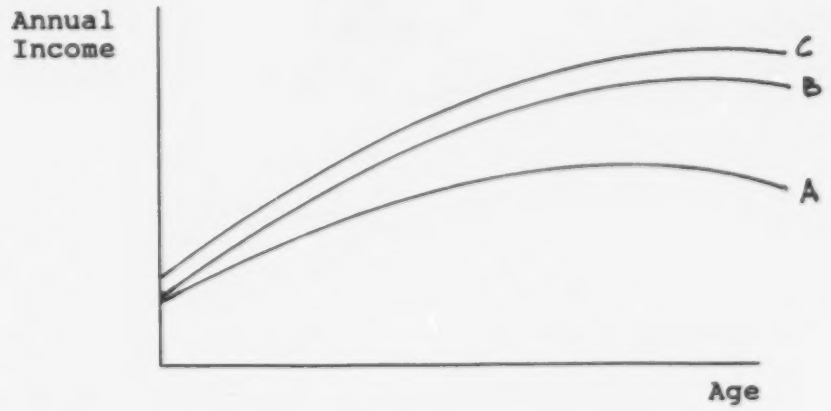
Although the borrowing rate for the assistance fund and the real growth rate (discussed next) are not policy options, they are variables whose effects can be tested in the model.

The positive difference between the borrowing rate for the fund and the rate charged on students' advances represents a public subsidy. It is assumed in the construction of this model that this subsidy (if any) would be paid annually by the government to the fund, such that the fund's accumulating debt would include only the same interest rate that is borne by graduates.

8. Real Growth Rate

The real growth rate per annum enters the calculations in two ways. This growth rate adjusts the cross-sectional age-earnings income data that are obtained from the census to provide a better estimate of individuals' expected lifetime earnings for each cohort. The specified growth rate is also applied to each successive cohort to increase the values of the student advances, the income brackets for calculating annual payments, and the adjusted expected lifetime earnings. This dual effect of the assumed growth rate is illustrated in Figure 1.

Figure 1.



A age-income profile derived from cross-sectional data
B age-specific incomes increased by real growth assumption
C age-income data from B increased by real growth for subsequent cohort

The model does not provide for a separate assumption about inflation. There are a number of reasons for this:

1. The model is intended for long-run policy development, and the only reasonable assumption is that the annual inflation rate will vary substantially over the four decades covered by the model.
2. The effect of inflation would likely be neutral since only the amount of the advance, the external interest rate, and graduates' incomes are affected by inflation. Each of these categories would likely experience the same degree of inflation over the long run.
3. If inflation were included in the calculations, the output would then need to be deflated to current dollar values so that the results (such as annual subsidy and outstanding debt) could be interpreted in the current budgetary context.
4. If an inflation rate is desired, inflation can be substituted for real growth in place of that variable.

POLICY DEFAULT VALUES AND ENROLMENT DATA

In order to establish default values for the parameters, it is necessary to assume specific values for the policy options and enrolment (or the number of eligible students). These are described below.

1. The value of the advance is set equal to actual tuition fee (in 1991-92) for each program:

Arts and Science	$1,770
Other Programs	1,770
Engineering, Architecture	1,920
Law	1,770
Medicine, Dentistry	2,250
Community Colleges (all programs)	800

2. The interest rate on advances to students is 1 per cent. Since no inflation is included in the model, 1 per cent represents a nominal rate of interest that is one percentage point above the rate of inflation. The rate assumed for borrowing by the fund is the real rate of interest of 3 per cent. There is therefore an implicit interest subsidy of 2 per cent.

3. Repayment commences when one's total employment income reaches $21,402. This was the median income in 1990 dollars for all Ontario taxpayers in 1989. The taxable portion is 94 per cent, or $20,118.

4. Repayment is based on taxable income. (The source and adjustments of income data are described in the next section.) The percentage of taxable income to be paid increases with income in accordance with the following scale:

Taxable income	Payment %
threshold to $29,999	2.0
30,000 - 39,999	2.5
40,000 - 49,999	3.0
50,000 - 59,999	3.5
60,000 - 69,999	4.0
70,000 and over	4.5

6. The maximum payment period is set at 25 years.

7. The real growth rate for monetary values (advances, graduates' incomes, threshold income, and income brackets) is set at zero. This is done so that the effects of alternative policy options can be seen more clearly. But a more realistic rate for estimating the actual flow of funds would be in the range of 1 to 2 per cent.

8. The enrolment data used as input represent students who are:

(i) residents of Ontario
(ii) enroled at publicly-supported universities or colleges in Ontario
(iii) registered full-time in first- and second-entry undergraduate programs

University enrolment data are actual full-time enrolment for the total Ontario university system for Fall 1990 provided by the Ministry of Colleges and Universities.[1] Enrolments for 1990-91 by program and gender are as follow:

[1] Part-time students were not included in the initial model because the computer programming would have been much more complex and would have substantially delayed the development of the model, for little additional information about the total fund flows. The impact of part-time enrolment on the outflow portion of the assistance fund can be calculated by using full-time-equivalent (FTE) enrolment data, but the repayments calculations would require detailed data on the labour force status of part-time students.

Universities (full-time)	Males	Females	Total
Arts and Science	14,249	20,100	35,349
Engineering, Architecture	3,569	710	4,279
Other programs*	6,555	7,682	14,237
Law	499	449	948
Medicine, Dentistry**	431	344	775

*Other programs include first-degree programs in agriculture, business or commerce, fine arts, forestry, household science, journalism, music, nursing, pharmacy, physical and health education. Second-entry degree programs in education are included in master's degree programs.

**Includes dentistry, medicine, veterinary science, and optometry. Enrolment in medicine includes McMaster's Year 1. Medical interns are excluded because they are in the labour force following medical school.

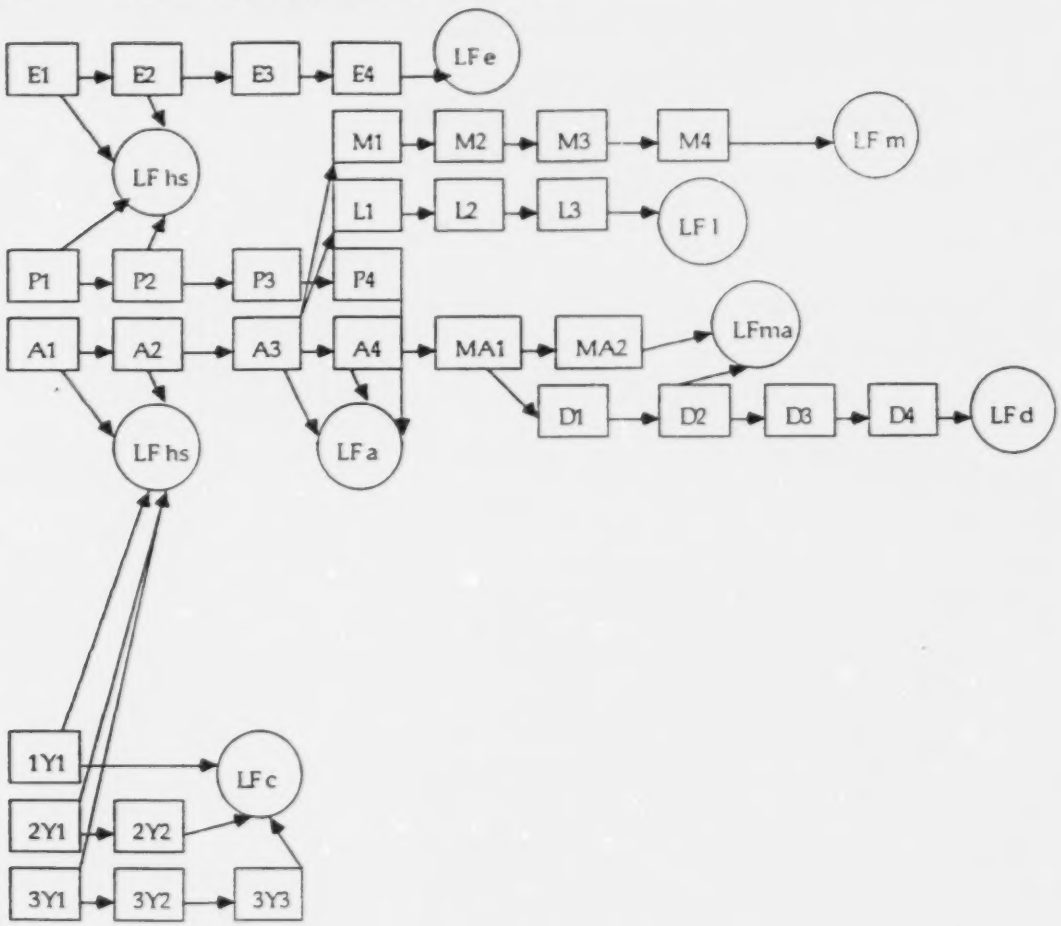
Note: Law and medicine enrolment data are used to determine the number of graduates from the Arts and Science 4-year program who enter these second-entry programs, and are included in the above data for first year enrolment for Arts and Science.

Community college enrolment data are actual full-time enrolment data for the total community college system for Fall 1989 provided by the Ministry of Colleges and Universities. (Data for Fall 1990 were not yet available.)

Community Colleges (full-time)						
Program Duration	**Technology, Arts, Business**		**Health**		**Total**	
	Males	**Females**	**Males**	**Females**	**Males**	**Females**
One year	891	1,978	272	1,379	1,163	3,357
Two years	12,223	15,667	120	387	12,343	16,054
Three years	8,333	5,565	374	3,195	8,707	8,760

In order to follow each sub-cohort through academic programs and into the labour force, assumptions need to be made about students' ages, attrition or dropout rates, length of programs and pre-professional education, and transition rates from undergraduate to graduate programs. The combination of these assumptions is illustrated in Figure 2.

Figure 2 Schematic Diagram of Sub-cohorts



Legend

A	Arts and Science
D	Doctorate
E	Engineering
L	Law
M	Medicine, etc
Ma	Masters
P	Other Programs
Y	Community college programs

LF	Labour force income streams
a	Bachelor degree graduates
c	Community college graduates
d	Doctorate degree graduates
e	Engineering, architecture
hs	High school graduates
l	Bachelor of law
m	Physicians, etc
ma	Master degree graduates

Age Students are assumed to enter at age 19. This assumption makes it possible to match graduates with an earnings profile, and with labour force participation and mortality rates. Although students actually enter at differing ages, this has a negligible effect on the final calculations because there would be no difference in the outflow of funds from the agency, and a negligible (if any) difference in the earnings streams.

Attrition The attrition or dropout rates for various university programs are assumed to be as follow:

Program	Dropout Rate (%)	At End of Year
University		
Arts and Science	10	1
Engineering, and	15	2
Other Programs		
Law		
Medicine	0	-
Masters		
Doctorate	30	2
Community Colleges		
Technology, Arts and Business		
One Year	50	1
Two Years	60	1
Three Years	60	1
Health		
One Year	25	1
Two Years	20	1
Three Years	30	1

Source: Estimated from Ministry of Colleges and University enrolment data for undergraduate and college programs for successive calendar years. Graduate program drop-outs are not based directly on data.

The assumptions regarding dropouts are based on the total enrolment data by academic year by program for successive calendar years. These rates are assumed to be the same for each gender. While the enrolment data can show the net change in enrolment moving through specific programs in successive academic years, they can only approximate the number of students that actually withdraw from the postsecondary educational system. No data have been found to provide direct evidence on permanent withdrawals. This is an important limitation of the data because these numbers affect both the calculations for the annual outflow of funds and the repayments.

Length of Programs The ratio of graduates from Arts and Science programs taking three-year and four-year degrees is assumed to be 60:40. This is based on data from the Ontario Council on University Affairs for Arts and Science graduates for 1984-88. The average time-to-degree is longer than the 3 or 4 years assumed in the model, but satisfactory evidence on the actual times is not available. Students are assumed to enter Law and Medicine following three years in Arts and Science programs.

Program	Length (years)
Arts and Science	3 years for 60%; 4 years for 40%
Engineering, Architecture	4
Other programs	4
Medicine, Dentistry	7 (3 A&S + 4 Meds/Dents)
Law	6 (3 A&S + 3 Law)
Masters	6 (4 A&S + 2 MA)
Doctorates	9 (4 A&S + 1 MA + 4 PhD)

Graduate Enrolment At the end of year 4 of Arts and Science, 20 per cent of the total graduates enter a Masters program but the male:female ratio within this entering group is assumed to be 60:40. At the end of Year 1 of the Masters programs, 35 per cent of the students enter Doctorate programs of four years duration. (The implicit gender ratio is again 60:40.) The balance of the Masters students complete a two-year program. Students in graduate programs do not receive an advance but they are included separately in the model to account for their later entry into the labour force and their different earnings data.

INCOME DATA

Data for UNIVersity and COLLEGE Programs

The basic income data used in this model are for the mean employment incomes[2] of Ontario residents, for calendar year 1985, by gender and five-year age groups. Because the data are for all persons who had any employment income in 1985, no adjustment of the data is required to take account of unemployment and part-time employment. Income data for high school graduates and for bachelor, master, and doctorate programs were obtained from the 1986 census of Canada as a custom order.

The income data are assigned to graduates of specific programs as follows:

Academic Programs	Occupational or Educational Category
Dropouts, undergraduate	high school graduates
Engineering and Architecture	bachelors of engineering, architecture
Law	bachelors of laws
Medicine, etc.	physicians, dentists, vets, optometrists (average weighted by enrolment)
Arts and Science and Other Programs	all bachelor degree graduates
Masters	masters graduates
Doctorates	doctorate graduates
Dropouts from doctorate programs	masters graduates

Income data are not available specifically for the graduates from public community colleges nor for all age groups by gender. Estimates of employment income of college

---

[2] Employment income data are used in this model but the implementation of a contingent repayment program could also be based on total income; this includes investment income and income from transfer payments. For graduates of postsecondary educational programs, however, there would be very little difference between total income and employment income. At very low incomes, employment income would be supplemented by various transfer payments (UIC, OAS, etc.) and at high income levels there would be some investment income. But the fund balances estimated by this model likely would not be changed in any significant way by using data for total income rather than employment income.

graduates were based on comparisons of the average income for persons with certificates or diplomas from non-university postsecondary institutions with the average income for both high school and university graduates. Incomes for graduates of Technology, Arts, or Business Programs were estimated by adding 20 per cent of the university - high school differential for each five-year age group to the high school income. Incomes for graduates of the Health programs were based on these college estimates by increasing male incomes by one-third and female incomes by one-half. These latter adjustments were based on differences in the starting salaries of recent graduates from the various programs, as provided by the Ministry of Colleges and Universities.

Incomes for individual years of age are derived from the means for five-year age groups by calculating the interpolated value.

The average or mean income has been used for all individuals at each age in each sub-cohort, but more accurate estimates of repayments could be obtained by using income data that reflected variance in incomes around the mean. This is especially important for income levels that are near the threshold level. The supplementary program (DECILES) therefore uses estimated median employment income by decile for a select group of sub-cohorts.

The 1985 income data were increased by 25 per cent to account for wage inflation between 1985 and 1990. This adjustment factor is based on the compound average annual increase in base rates (excluding COLA) in wage settlements (CANSIM D747018). The actual increase was 25.067 per cent. These data are shown in Appendix Tables A3 to A6.

The gross income data are converted to taxable income by multiplying by the factors

shown in the table below:

Gross Income (thousands)	Taxable Percentage
under $30	94
30 - 34.9	93
35 - 39.9	92
40 - 49.9	91
50 - 59.9	90
60 - 69.9	88
70 - 79.9	86
80 - 89.9	84
90 and over	83

Source: Revenue Canada, Taxation Statistics, 1989, p. 76.

Although the use of cross-sectional income data to estimate lifetime income is quite common, this underestimates individuals' true lifetime incomes. This problem can be overcome by introducing alternative assumptions in the model's default values about the real growth of incomes.

To estimate the proportion of graduates that would enter the labour force and receive employment income, the number of graduates from each program is multiplied by the probability of surviving to each succeeding year and the probability of participating in the labour force. The survival probabilities are based on the Life Tables for 1985-1987 for Ontario, by gender (Statistics Canada, Health Reports, supp. no. 13, vol. 2(4), 1990). The labour force participation probabilities are the labour force participation rates, from the 1986 census, for Ontario, by education, age group and gender. The labour force participation rates[3] used are as follow:

---

[3] The labour force participation rates assumed for undergraduate dropouts are the participation rates for high school graduates.

	Undergraduate Drop-outs		University and College Graduates	
Age	**M**	**F**	**M**	**F**
20-24	85	80	95	93
25-34	97	78	98	90
35-44	97	70	98	84
45-54	90	65	95	80
55-64	85	55	90	75
Source:	Statistics Canada, Census of Canada, 93-111. Rates are interpolated within the twenty-year age groups used in publication.			

These adjustments for mortality and labour force participation reduce the number of graduates in a given sub-cohort who will make annual payments, and thus reduce the annual payment to the assistance fund. The adjustments are implicit in the data shown in the tables titled "Adjusted Annual Payment".

The debt that is forgiven on the death of graduates can be estimated separately by reference to the life tables (column Q) that are appended to this document. These indicate that the annual mortality rate for males in the age range of 20 to 40 years is about one-tenth of one percent; and for females, the rate is less than one-half the rate for males.

When these rates are applied to the enrolment data used in the university model, there could be approximately 150 deaths per year when the assistance program was fully operational. The forgiven amount in each case could range from the maximum debt (at one or two years after graduation) to the minimum debt at one year before payment was completed. With 150 deaths per year, at an assumed average outstanding debt of $5,000, the total annual forgiven amount due to death would be $750,000. (The experience of the Canada and Ontario student loan plans could also provide data to estimate forgiven debts due to

death.)

The data used for graduates' incomes implicitly assume that graduates outside Ontario would have the same earnings pattern as those remaining in Ontario. The majority of graduates remain in Ontario, however, and no data are available to provide alternative estimates for non-residents.[4]

Data for the DECILES Program

The income data for the DECILES program are also obtained from the 1986 census and are adjusted for wage inflation to 1990 as described above. The income data, however, are the estimated median incomes for each decile of the population in selected sub-cohorts - Arts and Science second-year dropouts, Arts and Science four-year graduates, and college Arts, Business, and Technology two-year graduates.

The median incomes were estimated for each five-year age group in each sub-cohort from tables that showed the number of persons in each income range for each age-group/field of study/gender cross-tabulation. The size of the income ranges varied from $4,000 at low-income levels to $20,000 at high-income levels. The population included all persons, including those who did not work in 1985. Thus the median income for the lowest decile(s) takes into account those persons who did not work, and no separate adjustment for labour force participation rates is required. This is slightly different from adjusting the mean income

---

[4] It is sometimes suggested that graduates would emigrate from Canada in order to evade repayments under a contingent repayment program, but this would be a negligible factor in the program. Emigration of postsecondary graduates is low, and the repayment obligation would remain on the emigrant's file in Canada. Any request for service from the Canadian government (such as renewal of one's passport) would trigger a demand for payment.

data for labour force participation rates because the latter includes persons who were unemployed (but who were able and willing to work, and were looking for work). No adjustment is made for mortality because the DECILES program is intended to be used only for examining the effects of income differences on the cost of the forgiveness option.

The estimated median employment incomes for deciles of the sub-cohorts are shown in Appendix Tables A8 to A12.

Data on labour force participation and on income by age are available only on a cross-sectional basis. Longitudinal data for Canada that would provide evidence on the proportion of graduates who never or irregularly participate in the labour force, or on annual earnings over a lifetime, do not exist. Consequently, some strong assumptions must be made to estimate lifetime incomes, and especially for the decile groups. Most importantly, it is assumed that persons remain in the same decile throughout their working lifetimes. This presents the "worst case" set of income data because it does not represent persons who have irregular incomes - much as part-time workers, commissioned salespersons, persons with temporary illnesses or disabilities, and so on.

RUNNING THE COMPUTER PROGRAMS

The Programs

There are three computer programs that comprise the simulation model - UNIV, COLLEGE, and DECILES. These represent the university sector, the college sector, and the distribution of graduates' incomes by population deciles of selected sub-cohorts.

The DECILES program is provided as a supplement to the UNIV and COLLEGE programs, which are designed primarily to test the effects of alternative policy options on the aggregate funding for an assistance plan - that is, the annual financial outflows and inflows, and the annual debt balance of the fund. These calculations can be based on the mean income levels of the various sub-cohorts. But in order to estimate the annual costs that a government would incur for forgiven debts, it is necessary to disaggregate the sub-cohorts by incomes.

Although each graduate would have a unique lifetime earnings pattern, possibly including non-participation in the labour force at various intervals, a rough approximation of the income variation can be obtained by dividing selected sub-cohorts into population deciles and treating each of these as a sub-cohort in the DECILES program.[5]

The programs can be run on a personal computer with 640 K bytes of memory and two disk drives, but it is run more conveniently on a PC with a hard disk.

From the floppy disk, copy "univ.exe", "college.exe", and "deciles.exe" to a directory in the C: drive. At the C: prompt (or the operating system prompt with the active

---

[5] If each sub-cohort in the UNIV and COLLEGE programs (with a total of 54 sub-cohorts) had been disaggregated by deciles, the computer programs and output would have been expanded ten-fold, and obviously would have required more storage capacity and running time.

directory containing the copied program), enter UNIV (or COLLEGE or DECILES). The messages then seen by the user in the UNIV program are displayed in Appendix B. The first two screens show the default values of the parameters or policy options. These are the values that are used in the calculations if one answers 'n' or no to the question "Do you want to alter the starting values? (y/n)". The program commences calculations as soon as 'n' is entered. A 'y' or yes response invokes a series of questions that invite changes to the default values.

The value that can be entered for each policy option is constrained by a pre-assigned bound or range. This has been done to prevent the entry of typographical errors or illogical values. For example, the permitted range would prevent one from entering 1.0 instead of 0.01 when the intended interest rate is one per cent. It would also be impossible to enter negative values. The valid boundaries for parameter values are as follow:

Parameter	Range
Student interest rate	0 - 10 percent
Fund interest rate	0 - 10 percent
Real income growth rate	0 - 10 percent
Payment threshold	$0 - $40,000
Payment period	10 - 35 years
Payment rate:	
(for each income bracket)	0 - 10 percent
Advances to students	$0 - $10,000
Enrolments (in each sub-cohort)	0 - 100,000

An attempt to enter an unacceptable value results in the response "Value out of bounds - reset to [the upper or lower limit of the assignment range]". The program automatically assigns the maximum or minimum permitted value and then proceeds to the next prompt.

An attempt to enter anything except a numerical value (such as the letter O rather than zero), will invoke the response "Input must be a floating point - reenter".

It is not possible to go back to a previous option after the option has been exercised, nor to delete the value entered, but one can use the key-stroke combination Control-Break to abort the program and begin the sequence again.

In many cases, it will be sufficient to change the values of the policy options only for the first cohort of students in order to see the effects of these policy alternatives. One can therefore decline the option to run another or successive cohorts by responding 'n' to the question "Do you want another cohort (1 entered, 31 remain)?" But the option for successive cohorts presents the opportunity to change variables such as enrolments, advances, or interest rates for future cohorts, and thereby examine the effects of these changes on the financial status of the assistance fund over time. The question "Do you want to run successive cohorts (31 maximum)?", if answered affirmatively, is followed by "How many successive cohorts?" This can be answered by any number from 1 to 31, and then by accepting or altering the default values for each set of successive cohorts.

The program requires about 60 to 90 seconds to execute the calculations for one cohort and up to four or five minutes for 32 cohorts. When calculations are completed, the operating system prompt returns.

The results of this set of calculations are stored in files, called UNIV.OUT, COLL.OUT, or DECILES.OUT, that are generated automatically by the executable (.exe) program. Note that re-running these programs will over-write the previous output file. (Rename an output file if it must be retained for comparison with subsequent results, or for

other future use.)

To view these output tables, proceed as follows:

1. invoke WordPerfect (WP) at the operating system prompt, while in the directory containing the programs
2. change the margins to 0" and 0" in WP 5.1
3. press Control - F5; when menu appears, select 1. DOS text file, then 2. to retrieve, and retrieve UNIV.OUT or COLL.OUT or DECILES.OUT to see the tables. Alternatively, press List to see the directory and retrieve the desired file. Conversion of the DOS text file occurs automatically.

The set of values selected by the user for this simulation, the tables for each of the sub-cohorts, the income data tables, and the total table which aggregates the results for all sub-cohorts will be presented in that order. This sequence of tables is presented for each cohort, or group of cohorts, for which changes are made in the default values. Alternatively, the calculations based on the default values can be seen for any number of cohorts up to 32. (The Deciles output does not include the totals table because the Deciles program does not include all sub-cohorts.) These tables can then be edited, printed, and/or saved as separate files in WordPerfect.

Further experiments with the model can be conducted by exiting WordPerfect and returning to the operating system prompt and again invoking UNIV, COLLEGE, or DECILES.

Output Tables

Sample output tables included at the end of this section as Tables 2, 3, and 4. (The results shown in these tables are based on the default values described previously, on pages 9 and 10.) A brief discussion of the interpretation of these tables may be helpful. Note that all values, except in the employment income and annual repayments tables, are expressed in millions of dollars.

1. Sub-cohorts

Each of the tables for individual sub-cohorts (such as Table 2 for male graduates of a four-year Arts or Science program) shows comparable information which can be interpreted as follows:

Years and Ages These are self-explanatory.

Advance This column shows the total dollar value of the advances for each year for the sub-cohort, calculated as the number of students times the amount per student. In Table 2, (which is based on the default values) this is $5.45 million per year for four years.

Accumulated Advance This column shows the aggregation across calendar years of the total annual advances for each sub-cohort. The accumulated advances in Table 2 are $21.81 million. This total does not include interest charges.

Payment This column shows the total annual payments from graduates to the fund, calculated as the number of students in each sub-cohort times the "adjusted annual payment" per person that is calculated from the taxable income, repayment schedule, and mortality and labour force participation rates.

Outstanding Debt (O/S Debt) This column is calculated as follows: Amount advanced (if any) x interest rate, plus O/S debt in previous year x interest rate, minus repayment (if any). A positive outstanding debt in the final year of this column indicates the amount that would be forgiven, if this were part of the assistance program. In Table 2, the outstanding debt at graduation at age 22 is $22.36 million. All of the debt of this sub-cohort is repaid (by age 34) because the calculations are based on the mean income for all persons in this sub-cohort. But the DECILES program is designed to examine the repayment experience and outstanding debt for each decile in this sub-cohort.

Accumulated Interest This column shows the accumulated annual interest charged on the students' advances, up to the year in which the sub-cohort has repaid its outstanding debt. The final entry ($2.33 million in Table 2) shows the total interest cost for servicing the total or accumulated advances.

Subsidy This column shows the payment that would be made annually from the government to the assistance fund as an interest subsidy. The annual entry in this column is calculated as a multiple of the annual interest charge on students. For example, if the fund's borrowing rate is 8 per cent and the students' rate is 5 per cent, the subsidy is 3 percentage points or three-fifths of the students' interest cost.

The accumulated interest subsidy for the lifetime of a sub-cohort can be calculated by multiplying the students' accumulated interest by this fraction. In Table 2 for example, since the student rate is one per cent, and the subsidy is 2 percentage points, the accumulated subsidy is two times the accumulated interest, or $4.66 million over the fifteen years that this sub-cohort was in the assistance program.

2. Cohort Totals

Following the tables for sub-cohorts, and the tables showing employment income, taxable income, and annual payments to the fund, there is a single table (except in the DECILES program) that presents the totals obtained by summing across the values in each cell for all sub-cohorts. This is illustrated by Table 3 which aggregates the results for the 30 sub-cohorts in the university sector.

It is this Totals table that is most useful in examining the effects on the assistance fund of alternative policy options. For example, the Payment column will show changes in the total annual payments from graduates as the threshold income, repayment rate, and/or repayment period are changed. Changes in the total annual cost of any interest subsidy can be seen in the Subsidy column.

The Forgiveness column is included only in the UNIV and COLLEGE programs, and only in their Totals table. In the case of female dropouts from Arts and Science, Other Programs, Engineering, and from the college programs, the estimated annual income (equal to the income of high school graduates) never exceeds the threshold income so there are no annual payments. The outstanding debt after the assumed repayment period is the amount that is forgiven. This is aggregated across sub-cohorts and appears in the Forgiveness column in the cohort's totals table. Since the forgiveness amount is therefore overstated for the low-income sub-cohorts, and no forgiveness of debt is shown for the other sub-cohorts, the DECILES program was created to deal directly with this potential feature of an assistance fund.

The DECILES program divides sample sub-cohorts (Arts and Science dropouts and

four-year graduates, and college two-year graduates) into population deciles, and uses the estimated median income for each decile so that one can obtain a better estimate of the forgiven amounts. These amounts are read directly from the final amount in the column for Outstanding Debt for each sub-cohort, as explained above.

3. Multiple Cohort Totals

The Totals table presents the results for the total numbers of cohorts that have been entered in the model. This table, such as Table 4, is most useful for examining the effects of alternative policy options on the annual financial status of an assistance fund. For example, one can observe the maximum annual outflows from the fund, as Advances to students, the stage at which (under certain assumptions) the annual payments from graduates exceed the annual payments for advances, and the maximum outstanding debt of the fund. In Table 4, the maximum annual outflow is $311.29 million. This occurs over most of the period because no policy options or enrolments are changed for successive cohorts. The amount advanced declines after year 2021 because no new cohorts are entering and the final cohort is gradually leaving the assistance fund over the next six years. Annual payments to the fund reach a maximum of $330.08 million, and exceed the outflow in 2010 and the following years.

The maximum debt level for the fund is $4.023 billion, reached in 2016, and declines after 2021 as total annual advances begin to decline. If there had been additional cohorts added to the program after 2021, the fund would have continued to operate at the $4 billion plateau.

The annual subsidy payments reach a maximum of $80.36 million in 2016; this continues to 2021 and then also declines.

The forgiveness total is less meaningful, as explained above, since income variation is not taken into account in this set of calculations. The age column can be ignored in the multiple cohort table because it refers only to the age of the first cohort at each calendar year.

Table 2

ARTS & SCIENCE GRADS (4 yr) -- MALE

YEAR	AGE	ADVANCE	ACCUM ADV	PAYMENT	O/S DEBT	ACCUM INT	SUBSIDY
1990	19	5.45	5.45	0.00	5.51	0.05	0.11
1991	20	5.45	10.90	0.00	11.07	0.16	0.22
1992	21	5.45	16.35	0.00	16.68	0.33	0.33
1993	22	5.45	21.81	0.00	22.36	0.55	0.44
1994	23	0.00	0.00	0.00	22.58	0.77	0.45
1995	24	0.00	0.00	1.24	21.57	1.00	0.45
1996	25	0.00	0.00	1.40	20.39	1.22	0.43
1997	26	0.00	0.00	1.52	19.08	1.42	0.41
1998	27	0.00	0.00	1.64	17.63	1.61	0.38
1999	28	0.00	0.00	1.80	16.01	1.79	0.35
2000	29	0.00	0.00	2.44	13.73	1.95	0.32
2001	30	0.00	0.00	2.65	11.22	2.08	0.27
2002	31	0.00	0.00	2.84	8.49	2.20	0.22
2003	32	0.00	0.00	3.67	4.91	2.28	0.17
2004	33	0.00	0.00	3.83	1.13	2.33	0.10
2005	34	0.00	0.00	1.14	-0.00	0.00	0.00
2006	35						
2007	36						
2008	37						
2009	38						
2010	39						
2011	40						
2012	41						
2013	42						
2014	43						
2015	44						
2016	45						
2017	46						
2018	47						
2019	48						
2020	49						
2021	50						
2022	51						
2023	52						
2024	53						
2025	54						
2026	55						
2027	56						
2028	57						
2029	58						

Note: Calculations are based on the default values for policy options, as displayed in Appendix B, page 45.

Table 3

UNIVERSITY TOTALS -- Males and Females Combined (1 cohort)

YEAR	AGE	ADVANCE	ACCUM ADV	PAYMENT	O/S DEBT	ACCUM INT	SUBSIDY	FORGIVE
1990	19	95.98	95.98	0.00	96.94	0.96	1.92	0.00
1991	20	86.39	182.37	0.00	185.16	2.79	3.67	0.00
1992	21	73.43	255.79	0.00	261.17	5.38	5.17	0.00
1993	22	46.91	302.70	0.00	311.16	8.46	6.16	0.00
1994	23	3.42	306.13	0.00	317.73	11.61	6.29	0.00
1995	24	3.42	309.55	7.18	317.18	14.82	6.42	0.00
1996	25	1.74	311.29	11.08	311.04	18.01	6.38	0.00
1997	26	0.00	0.00	19.98	294.17	21.12	6.22	0.00
1998	27	0.00	0.00	22.06	275.05	24.06	5.88	0.00
1999	28	0.00	0.00	24.33	253.47	26.81	5.50	0.00
2000	29	0.00	0.00	27.62	228.38	29.34	5.06	0.00
2001	30	0.00	0.00	29.41	201.26	31.62	4.57	0.00
2002	31	0.00	0.00	31.39	171.88	33.64	4.03	0.00
2003	32	0.00	0.00	34.22	139.38	35.29	3.31	0.00
2004	33	0.00	0.00	27.71	113.06	36.68	2.78	0.00
2005	34	0.00	0.00	17.96	96.23	37.77	2.19	0.00
2006	35	0.00	0.00	13.31	83.89	38.73	1.92	0.00
2007	36	0.00	0.00	13.31	71.41	39.57	1.67	0.00
2008	37	0.00	0.00	12.31	59.82	40.28	1.42	0.00
2009	38	0.00	0.00	11.92	48.49	40.88	1.20	0.00
2010	39	0.00	0.00	8.54	40.44	41.36	0.97	0.00
2011	40	0.00	0.00	8.62	32.22	41.76	0.80	0.00
2012	41	0.00	0.00	8.14	24.40	42.08	0.63	0.00
2013	42	0.00	0.00	0.99	23.66	42.31	0.47	0.00
2014	43	0.00	0.00	0.00	23.90	42.55	0.47	0.00
2015	44	0.00	0.00	0.00	24.13	42.79	0.48	6.55
2016	45	0.00	0.00	0.00	17.76	42.97	0.35	17.76
2017	46							
2018	47							
2019	48							
2020	49							
2021	50							
2022	51							
2023	52							
2024	53							
2025	54							
2026	55							
2027	56							
2028	57							
2029	58							

Note: Calculations are based on the default values for policy options, as displayed in Appendix B, page 45.

Table 4

UNIVERSITY TOTALS -- Males and Females Combined (32 cohorts)

YEAR	AGE	ADVANCE	PAYMENT	O/S DEBT	SUBSIDY	FORGIVE
1990	19	95.98	0.00	96.94	1.92	0.00
1991	20	182.37	0.00	282.10	5.59	0.00
1992	21	255.79	0.00	543.28	10.76	0.00
1993	22	302.70	0.00	854.44	16.92	0.00
1994	23	306.13	0.00	1172.17	23.21	0.00
1995	24	309.55	7.18	1489.36	27.30	0.00
1996	25	311.29	18.26	1800.39	33.16	0.00
1997	26	311.29	38.24	2094.56	36.67	0.00
1998	27	311.29	60.30	2369.61	42.55	0.00
1999	28	311.29	84.63	2623.08	47.81	0.00
2000	29	311.29	112.25	2851.47	52.84	0.00
2001	30	311.29	141.66	3052.73	57.40	0.00
2002	31	311.29	173.05	3224.61	61.43	0.00
2003	32	311.29	207.27	3363.99	64.87	0.00
2004	33	311.29	234.98	3477.05	67.65	0.00
2005	34	311.29	252.94	3573.28	69.91	0.00
2006	35	311.29	266.25	3657.17	71.84	0.00
2007	36	311.29	279.56	3728.58	73.52	0.00
2008	37	311.29	291.87	3788.40	74.95	0.00
2009	38	311.29	303.80	3836.89	76.14	0.00
2010	39	311.29	312.34	3877.33	77.11	0.00
2011	40	311.29	320.96	3909.54	77.92	0.00
2012	41	311.29	329.10	3933.95	78.56	0.00
2013	42	311.29	330.08	3957.61	79.05	0.00
2014	43	311.29	330.08	3981.50	79.53	0.00
2015	44	311.29	330.08	4005.64	80.00	6.55
2016	45	311.29	330.08	4023.40	80.36	24.31
2017	46	311.29	330.08	4023.40	80.36	24.31
2018	47	311.29	330.08	4023.40	80.36	24.31
2019	48	311.29	330.08	4023.40	80.36	24.31
2020	49	311.29	330.08	4023.40	80.36	24.31
2021	50	311.29	330.08	4023.40	80.36	24.31
2022	51	215.31	330.08	3926.46	80.12	24.31
2023	52	128.92	330.08	3741.30	78.04	24.31
2024	53	55.50	330.08	3480.12	74.34	24.31
2025	54	8.59	330.08	3168.96	69.12	24.31
2026	55	5.17	330.08	2851.23	62.89	24.31
2027	56	1.74	322.90	2534.05	56.54	24.31
2028	57	0.00	311.82	2223.01	50.19	24.31
2029	58	0.00	291.84	1928.84	43.97	0.00

Note: Calculations are based on the default values for policy options, as displayed in Appendix B, page 45.

APPENDIX A: TABLES

Table A1 Life Tables, 1985-87, Ontario, Males

AGE	L	D	P	Q
0	100000	767	0.99233	0.00767
1	99233	62	0.99937	0.00063
2	99171	43	0.99956	0.00044
3	99128	31	0.99969	0.00031
4	99097	28	0.99972	0.00028
15	98842	59	0.99940	0.00060
16	98783	72	0.99927	0.00073
17	98711	83	0.99916	0.00084
18	98628	90	0.99908	0.00092
19	98538	98	0.99901	0.00099
20	98440	104	0.99895	0.00105
21	98336	107	0.99891	0.00109
22	98229	111	0.99888	0.00112
23	98118	111	0.99887	0.00113
24	98007	109	0.99888	0.00112
25	97898	107	0.99891	0.00109
26	97791	105	0.99893	0.00107
27	97686	104	0.99893	0.00107
28	97582	106	0.99892	0.00108
29	97476	107	0.99890	0.00110
30	97369	110	0.99887	0.00113
31	97259	113	0.99884	0.00116
32	97146	116	0.99880	0.00120
33	97030	120	0.99877	0.00123
34	96910	122	0.99874	0.00126
35	96788	125	0.99871	0.00129
36	96663	130	0.99865	0.00135
37	96533	138	0.99857	0.00143
38	96395	148	0.99846	0.00154
39	96247	161	0.99833	0.00167
40	96086	175	0.99818	0.00182
41	95911	192	0.99800	0.00200
42	95719	211	0.99780	0.00220
43	95508	231	0.99758	0.00242
44	95277	251	0.99736	0.00264
45	95026	276	0.99711	0.00289
46	94750	303	0.99680	0.00320
47	94447	337	0.99642	0.00358
48	94110	379	0.99598	0.00402
49	93731	423	0.99548	0.00452
50	93308	474	0.99492	0.00508
51	92834	529	0.99430	0.00570
52	92305	589	0.99362	0.00638
53	91716	652	0.99289	0.00711
54	91064	719	0.99211	0.00789

L Number surviving from initial cohort of 100,000 births
D Number dying in each year of age
P Proportion surviving from beginning to end of each year of age
Q Proportion of cohort beginning the year dying during the year

Source: Statistics Canada, Health Reports, supp.no. 13, vol. 2(4), 1990.

Table A2 Life Tables, 1985-87, Ontario, Females

AGE	L	D	P	Q
0	100000	638	0.99362	0.00638
1	99362	58	0.99941	0.00059
2	99304	39	0.99961	0.00039
3	99265	28	0.99971	0.00029
4	99237	26	0.99975	0.00025
15	99053	28	0.99971	0.00029
16	99025	33	0.99967	0.00033
17	98992	36	0.99964	0.00036
18	98956	37	0.99963	0.00037
19	98919	37	0.99962	0.00038
20	98882	37	0.99963	0.00037
21	98845	36	0.99963	0.00037
22	98809	36	0.99963	0.00037
23	98773	37	0.99963	0.00037
24	98736	37	0.99962	0.00038
25	98699	38	0.99962	0.00038
26	98661	38	0.99961	0.00039
27	98623	40	0.99960	0.00040
28	98583	41	0.99958	0.00042
29	98542	43	0.99956	0.00044
30	98499	46	0.99954	0.00046
31	98453	48	0.99951	0.00049
32	98405	51	0.99948	0.00052
33	98354	54	0.99945	0.00055
34	98300	58	0.99941	0.00059
35	98242	62	0.99937	0.00063
36	98180	68	0.99931	0.00069
37	98112	74	0.99924	0.00076
38	98038	84	0.99915	0.00085
39	97954	93	0.99904	0.00096
40	97861	106	0.99892	0.00108
41	97755	118	0.99879	0.00121
42	97637	133	0.99864	0.00136
43	97504	148	0.99848	0.00152
44	97356	165	0.99831	0.00169
45	97191	181	0.99813	0.00187
46	97010	201	0.99793	0.00207
47	96809	223	0.99770	0.00230
48	96586	247	0.99745	0.00255
49	96339	273	0.99717	0.00283
50	96066	300	0.99687	0.00313
51	95766	331	0.99655	0.00345
52	95435	361	0.99621	0.00379
53	95074	393	0.99587	0.00413
54	94681	425	0.99551	0.00449

L Number surviving from initial cohort of 100,000 births
D Number dying in each year of age
P Proportion surviving from beginning to end of each year of age
Q Proportion of cohort beginning the year dying during the year

Source: Statistics Canada, Health Reports, supp.no. 13, vol. 2(4), 1990.

Table A3 Mean Employment Incomes in UNIV Program, Ontario, Males, 1990

AGE	HIGHSCH	ARTS&SCI	ENGINEER	LAW	MEDS	MASTERS	DOCTORATE
19	5740	0	0	0	0	0	0
20	8124	0	0	0	0	0	0
21	10649	0	0	0	0	0	0
22	13391	18750	0	0	0	0	0
23	16488	20000	14721	0	0	0	0
24	19320	22500	23261	16250	31250	25000	24495
25	21775	24629	26645	17872	36762	25176	24762
26	24229	26758	30028	19495	42274	25352	25029
27	26684	28886	33411	21118	47786	25529	25296
28	27915	32016	35790	26947	56234	29067	28757
29	29147	35146	38169	32776	64682	32605	32218
30	30379	38276	40548	38605	73130	36143	35679
31	31611	41406	42927	44434	81577	39681	39140
32	32842	44536	45306	50264	90025	43219	42601
33	33742	46519	46688	54299	96884	45792	44802
34	34642	48502	48069	58334	103744	48366	47004
35	35542	50485	49450	62369	110604	50939	49205
36	36442	52468	50831	66404	117463	53513	51406
37	37342	54451	52212	70439	124322	56086	53608
38	38208	56770	54030	77532	126658	57615	56114
39	39073	59089	55848	84625	128994	59144	58620
40	39938	61408	57666	91718	131330	60672	61126
41	40804	63726	59484	98812	133666	62201	63632
42	41669	66045	61302	105905	136001	63730	66139
43	42064	66874	62511	105081	137441	64469	66860
44	42460	67703	63719	104258	138881	65208	67580
45	42856	68532	64927	103434	140320	65948	68301
46	43252	69361	66136	102610	141760	66687	69022
47	43648	70190	67344	101786	143200	67426	69742
48	43476	71258	69322	99072	142461	67567	69748
49	43305	72326	71301	96358	141722	67707	69753
50	43134	73394	73279	93644	140983	67848	69758
51	42962	74462	75258	90929	140244	67988	69764
52	42791	75530	77236	88215	139505	68129	69769
53	42840	75517	76634	89724	136403	68055	72046
54	42890	75504	76031	91234	133302	67981	74324
55	42939	75490	75429	92744	130200	67907	76602
56	42988	75477	74826	94253	127098	67833	78880
57	43038	75464	74224	95762	123996	67759	81158
58	41350	74098	71867	95752	120955	65793	80120

Note: Data are estimated for ages prior to 25 from data for the 15-24 age group.

Table A4 Mean Employment Incomes in UNIV Program, Ontario, Females, 1990

AGE	HIGHSCH	ARTS&SCI	ENGINEER	LAW	MEDS	MASTERS	DOCTORATE
19	4832	0	0	0	0	0	0
20	6642	0	0	0	0	0	0
21	8390	0	0	0	0	0	0
22	10551	16250	0	0	0	0	0
23	12689	17500	14325	0	0	0	0
24	14410	18750	22309	15000	27500	22500	15000
25	15295	20180	24164	16895	30419	22638	15280
26	16180	21610	26019	18791	33338	22776	15559
27	17065	23040	27874	20686	36256	22914	15839
28	17290	24152	28630	23956	40948	24611	19248
29	17515	25265	29385	27226	45641	26308	22658
30	17740	26378	30141	30496	50333	28005	26067
31	17965	27490	30897	33766	55025	29702	29477
32	18190	28602	31652	37036	59718	31399	32886
33	18366	29168	30836	39182	61480	32461	34156
34	18542	29734	30020	41329	63243	33522	35425
35	18718	30300	29204	43475	65006	34584	36694
36	18894	30866	28388	45621	66768	35646	37963
37	19070	31432	27571	47768	68531	36708	39232
38	19210	31854	29620	49336	70902	37149	40572
39	19351	32276	31668	50905	73273	37591	41912
40	19492	32697	33717	52474	75644	38033	43251
41	19632	33118	35765	54042	78014	38474	44590
42	19772	33540	37814	55611	80385	38916	45930
43	19761	33761	36890	53466	81088	39132	45981
44	19750	33982	35965	51320	81792	39347	46032
45	19739	34203	35041	49174	82496	39562	46082
46	19728	34424	34117	47028	83199	39777	46133
47	19716	34645	33192	44882	83902	39992	46184
48	19556	34525	34502	43889	84320	40304	47296
49	19396	34406	35810	42896	84737	40616	48409
50	19236	34286	37120	41903	85154	40928	49521
51	19075	34166	38428	40910	85572	41240	50634
52	18915	34046	39738	39916	85989	41551	51746
53	18925	33693	36130	42369	81939	41598	51061
54	18934	33340	32522	44822	77889	41645	50375
55	18944	32987	28915	47275	73840	41692	49690
56	18954	32634	25308	49728	69790	41739	49004
57	18964	32281	21700	52181	65740	41786	48319
58	18846	32233	22056	48288	66405	41205	48452

Note: Data are estimated for ages prior to 25 from data for the 15-24 age group.

Table A5 Mean Employment Incomes in COLLEGE Program, Ontario, Males, 1990

AGE	HIGHSCH	HEALTH	A,B&TECH
19	5740	0	0
20	8124	15625	11750
21	10649	17250	13000
22	13391	19250	14500
23	16488	23000	17250
24	19320	27875	21000
25	21775	30625	23042
26	24229	33375	25083
27	26684	36125	27125
28	27915	38250	28725
29	29147	40375	30325
30	30379	42500	31925
31	31611	44625	33525
32	32842	46750	35125
33	33742	48250	36250
34	34642	49750	37375
35	35542	51250	38500
36	36442	52750	39625
37	37342	54250	40750
38	38208	55725	41875
39	39073	57200	43000
40	39938	58675	44125
41	40804	60150	45250
42	41669	61625	46375
43	42064	62300	46875
44	42460	62975	47375
45	42856	63650	47875
46	43252	64325	48375
47	43648	65000	48875
48	43476	65125	48975
49	43305	65250	49075
50	43134	65375	49175
51	42962	65500	49275
52	42791	65625	49375
53	42840	65575	49325
54	42890	65525	49275
55	42939	65475	49225
56	42988	65425	49175
57	43038	65375	49125
58	41350	63175	47475

Note: Data are estimated for ages prior to 25 from data for the 15-24 age group.

Table A6 **Mean Employment Incomes in COLLEGE Program, Ontario, Females, 1990**

AGE	HIGHSCH	HEALTH	A,B&TECH
19	4832	0	0
20	6642	15000	10000
21	8390	16312	10875
22	10551	17625	11750
23	12689	20438	13625
24	14410	22875	15250
25	15295	24375	16250
26	16180	25875	17250
27	17065	27375	18250
28	17290	27975	18650
29	17515	28575	19050
30	17740	29175	19450
31	17965	29775	19850
32	18190	30375	20250
33	18366	30750	20500
34	18542	31125	20750
35	18718	31500	21000
36	18894	31875	21250
37	19070	32250	21500
38	19210	32550	21700
39	19351	32850	21900
40	19492	33150	22100
41	19632	33450	22300
42	19772	33750	22500
43	19761	33788	22525
44	19750	33825	22550
45	19739	33862	22575
46	19728	33900	22600
47	19716	33938	22625
48	19556	33750	22500
49	19396	33562	22375
50	19236	33375	22250
51	19075	33188	22125
52	18915	33000	22000
53	18925	32888	21925
54	18934	32775	21850
55	18944	32662	21775
56	18954	32550	21700
57	18964	32438	21625
58	18846	32250	21500

Note: Data are estimated for ages prior to 25 from data for the 15-24 age group.

Table A7 Median Employment Incomes, by Deciles, High School Graduates, Ontario, Males, 1990

AGE	DECILE1	DECILE2	DECILE3	DECILE4	DECILE5	DECILE6	DECILE7	DECILE8	DECILE9	DECILE10
21	125	3750	3750	7500	10000	12500	15000	20000	25000	30000
22	125	3750	5000	10000	12500	15000	17500	23750	27500	32500
23	125	5000	8750	12500	15000	17500	20000	27500	32500	36250
24	125	6250	12500	15000	17500	20000	22500	30000	35000	40000
25	167	7083	13750	16708	19958	22542	25917	32208	36917	42542
26	208	7917	15000	18417	22417	25083	29333	34417	38833	45083
27	250	8750	16250	20125	24875	27625	32750	36625	40750	47625
28	400	9725	17050	21325	26050	29050	33800	37625	42025	50250
29	550	10700	17850	22525	27225	30475	34850	38625	43300	52875
30	700	11675	18650	23725	28400	31900	35900	39625	44575	55500
31	850	12650	19450	24925	29575	33325	36950	40625	45850	58125
32	1000	13625	20250	26125	30750	34750	38000	41625	47125	60750
33	1200	14050	20975	26700	31200	35175	38575	42275	47900	60875
34	1400	14475	21700	27275	31650	35600	39150	42925	48675	61000
35	1600	14900	22425	27850	32100	36025	39725	43575	49450	61125
36	1800	15325	23150	28425	32550	36450	40300	44225	50225	61250
37	2000	15750	23875	29000	33000	36875	40875	44875	51000	61375
38	1925	16075	24400	29575	33625	37550	41700	45850	52675	64400
39	1850	16400	24925	30150	34250	38225	42525	46825	54350	67425
40	1775	16725	25450	30725	34875	38900	43350	47800	56025	70450
41	1700	17050	25975	31300	35500	39575	44175	48775	57700	73475
42	1625	17375	26500	31875	36125	40250	45000	49750	59375	76500
43	1300	16900	26325	32175	36600	40825	45475	50550	59900	77200
44	975	16425	26150	32475	37075	41400	45950	51350	60425	77900
45	650	15950	25975	32775	37550	41975	46425	52150	60950	78600
46	325	15475	25800	33075	38025	42550	46900	52950	61475	79300
47	0	15000	25625	33375	38500	43125	47375	53750	62000	80000
48	0	14550	25225	32475	37825	42450	46775	53025	61575	79750
49	0	14100	24825	31575	37150	41775	46175	52300	61150	79500
50	0	13650	24425	30675	36475	41100	45575	51575	60725	79250
51	0	13200	24025	29775	35800	40425	44975	50850	60300	79000
52	0	12750	23625	28875	35125	39750	44375	50125	59875	78750
53	0	10700	21825	27825	34100	38850	43775	49675	59325	77375
54	0	8650	20025	26775	33075	37950	43175	49225	58775	76000
55	0	6600	18225	25725	32050	37050	42575	48775	58225	74625
56	0	4550	16425	24675	31025	36150	41975	48325	57675	73250
57	0	2500	14625	23625	30000	35250	41375	47875	57125	71875
58	0	2000	11700	19675	26875	32600	39150	45575	54425	71500

Note: Data are estimated for ages prior to 25 from data for the 15-24 age group.

Table A8 Median Employment Incomes, by Deciles, High School Graduates, Ontario, Females, 1990

AGE	DECILE1	DECILE2	DECILE3	DECILE4	DECILE5	DECILE6	DECILE7	DECILE8	DECILE9	DECILE10
21	0	0	0	2500	5000	7500	10000	12500	15000	20000
22	0	0	0	3750	6250	8750	11250	15000	17500	22500
23	0	0	1250	5000	7500	10000	13750	17500	20000	27500
24	0	0	1250	6250	8750	12500	16250	20000	22500	32500
25	0	0	1542	6292	9667	13458	17458	21042	23792	33833
26	0	0	1833	6333	10583	14417	18667	22083	25083	35167
27	0	0	2125	6375	11500	15375	19875	23125	26375	36500
28	0	0	1700	5875	11000	15025	19675	23175	26675	36600
29	0	0	1275	5375	10500	14675	19475	23225	26975	36700
30	0	0	850	4875	10000	14325	19275	23275	27275	36800
31	0	0	425	4375	9500	13975	19075	23325	27575	36900
32	0	0	0	3875	9000	13625	18875	23375	27875	37000
33	0	0	25	4000	9050	13700	18925	23200	28450	38850
34	0	0	50	4125	9100	13775	18975	23025	29025	40700
35	0	0	75	4250	9150	13850	19025	22850	29600	42550
36	0	0	100	4375	9200	13925	19075	22675	30175	44400
37	0	0	125	4500	9250	14000	19125	22500	30750	46250
38	0	0	875	5150	10000	14750	19700	23300	31000	46525
39	0	0	1625	5800	10750	15500	20275	24100	31250	46800
40	0	0	2375	6450	11500	16250	20850	24900	31500	47075
41	0	0	3125	7100	12250	17000	21425	25700	31750	47350
42	0	0	3875	7750	13000	17750	22000	26500	32000	47625
43	0	0	3100	7150	12300	17150	21525	25900	31575	46550
44	0	0	2325	6550	11600	16550	21050	25300	31150	45475
45	0	0	1550	5950	10900	15950	20575	24700	30725	44400
46	0	0	775	5350	10200	15350	20100	24100	30300	43325
47	0	0	0	4750	9500	14750	19625	23500	29875	42250
48	0	0	0	4125	8900	14075	19325	23375	29675	41550
49	0	0	0	3500	8300	13400	19025	23250	29475	40850
50	0	0	0	2875	7700	12725	18725	23125	29275	40150
51	0	0	0	2250	7100	12050	18425	23000	29075	39450
52	0	0	0	1625	6500	11375	18125	22875	28875	38750
53	0	0	0	1300	5725	10650	17375	22400	28425	38300
54	0	0	0	975	4950	9925	16625	21925	27975	37850
55	0	0	0	650	4175	9200	15875	21450	27525	37400
56	0	0	0	325	3400	8475	15125	20975	27075	36950
57	0	0	0	0	2625	7750	14375	20500	26625	36500
58	0	0	0	0	2100	7250	13675	19500	25500	35200

Note: Data are estimated for ages prior to 25 from data for the 15-24 age group.

Table A9 Median Employment Incomes, by Deciles, Arts and Science Graduates, Ontario, Males, 1990

AGE	DECILE1	DECILE2	DECILE3	DECILE4	DECILE5	DECILE6	DECILE7	DECILE8	DECILE9	DECILE10
21	125	1250	2500	3750	12500	17500	23750	26250	27500	27500
22	125	2500	5000	6250	15000	18750	25000	28750	31250	32500
23	125	3750	7500	10000	17500	20000	26250	31250	37500	40000
24	125	5000	10000	13750	20000	22500	27500	33750	43750	50000
25	125	5417	10625	14583	20833	24167	29000	36250	45833	52500
26	125	5833	11250	15417	21667	25833	30500	38750	47917	55000
27	125	6250	11875	16250	22500	27500	32000	41250	50000	57500
28	800	7025	14000	19025	24925	29900	34425	42800	51000	59250
29	1475	7800	16125	21800	27350	32300	36850	44350	52000	61000
30	2150	8575	18250	24575	29775	34700	39275	45900	53000	62750
31	2825	9350	20375	27350	32200	37100	41700	47450	54000	64500
32	3500	10125	22500	30125	34625	39500	44125	49000	55000	66250
33	3775	12600	24625	32125	36875	41600	46875	52200	61025	77000
34	4050	15075	26750	34125	39125	43700	49625	55400	67050	87750
35	4325	17550	28875	36125	41375	45800	52375	58600	73075	98500
36	4600	20025	31000	38125	43625	47900	55125	61800	79100	109250
37	4875	22500	33125	40125	45875	50000	57875	65000	85125	120000
38	4900	23000	34175	41350	47075	51400	58650	66575	87100	121000
39	4925	23500	35225	42575	48275	52800	59425	68150	89075	122000
40	4950	24000	36275	43800	49475	54200	60200	69725	91050	123000
41	4975	24500	37325	45025	50675	55600	60975	71300	93025	124000
42	5000	25000	38375	46250	51875	57000	61750	72875	95000	125000
43	5000	25375	39775	46800	52325	57375	62425	73300	97250	127500
44	5000	25750	41175	47350	52775	57750	63100	73725	99500	130000
45	5000	26125	42575	47900	53225	58125	63775	74150	101750	132500
46	5000	26500	43975	48450	53675	58500	64450	74575	104000	135000
47	5000	26875	45375	49000	54125	58875	65125	75000	106250	137500
48	4775	26500	44800	49375	54825	59850	66675	77500	110500	135000
49	4550	26125	44225	49750	55525	60825	68225	80000	114750	132500
50	4325	25750	43650	50125	56225	61800	69775	82500	119000	130000
51	4100	25375	43075	50500	56925	62775	71325	85000	123250	127500
52	3875	25000	42500	50875	57625	63750	72875	87500	127500	125000
53	3100	22025	40000	48950	56600	62750	72050	87000	127000	130000
54	2325	19050	37500	47025	55575	61750	71225	86500	126500	135000
55	1550	16075	35000	45100	54550	60750	70400	86000	126000	140000
56	775	13100	32500	43175	53525	59750	69575	85500	125500	145000
57	0	10125	30000	41250	52500	58750	68750	85000	125000	150000
58	0	8100	25025	37275	49150	56775	67050	83000	120250	146250

Note: Data are estimated for ages prior to 25 from data for the 15-24 age group.

Table A10 Median Employment Incomes, by Deciles, Arts and Science Graduates, Ontario, Females, 1990

AGE	DECILE1	DECILE2	DECILE3	DECILE4	DECILE5	DECILE6	DECILE7	DECILE8	DECILE9	DECILE10
21	0	0	2500	3750	7500	15000	12500	12500	16250	20000
22	0	0	3750	5000	10000	16250	16250	16250	21250	22500
23	0	0	5000	6250	12500	17500	18750	21250	25000	26250
24	0	2500	6250	8750	15000	18750	21250	25000	28750	33750
25	0	2917	7083	9375	15333	19208	21792	26458	30458	36042
26	0	3333	7917	10000	15667	19667	22333	27917	32167	38333
27	0	3750	8750	10625	16000	20125	22875	29375	33875	40625
28	0	3000	8100	11125	16800	21300	24700	31125	35900	43700
29	0	2250	7450	11625	17600	22475	26525	32875	37925	46775
30	0	1500	6800	12125	18400	23650	28350	34625	39950	49850
31	0	750	6150	12625	19200	24825	30175	36375	41975	52925
32	0	0	5500	13125	20000	26000	32000	38125	44000	56000
33	0	0	4550	11800	19025	25450	31325	38075	44750	56475
34	0	0	3600	10475	18050	24900	30650	38025	45500	56950
35	0	0	2650	9150	17075	24350	29975	37975	46250	57425
36	0	0	1700	7825	16100	23800	29300	37925	47000	57900
37	0	0	750	6500	15125	23250	28625	37875	47750	58375
38	0	0	2100	8275	16875	24825	30800	39425	49100	58950
39	0	0	3450	10050	18625	26400	32975	40975	50450	59525
40	0	0	4800	11825	20375	27975	35150	42525	51800	60100
41	0	0	6150	13600	22125	29550	37325	44075	53150	60675
42	0	0	7500	15375	23875	31125	39500	45625	54500	61250
43	0	75	7500	15350	24175	31425	39650	46025	54650	61450
44	0	150	7500	15325	24475	31725	39800	46425	54800	61650
45	0	225	7500	15300	24775	32025	39950	46825	54950	61850
46	0	300	7500	15275	25075	32325	40100	47225	55100	62050
47	0	375	7500	15250	25375	32625	40250	47625	55250	62250
48	0	300	6775	14500	24700	31900	40300	47750	54975	62100
49	0	225	6050	13750	24025	31175	40350	47875	54700	61950
50	0	150	5325	13000	23350	30450	40400	48000	54425	61800
51	0	75	4600	12250	22675	29725	40450	48125	54150	61650
52	0	0	3875	11500	22000	29000	40500	48250	53875	61500
53	0	0	3100	9800	19425	27150	38125	46650	53250	60950
54	0	0	2325	8100	16850	25300	35750	45050	52625	60400
55	0	0	1550	6400	14275	23450	33375	43450	52000	59850
56	0	0	775	4700	11700	21600	31000	41850	51375	59300
57	0	0	0	3000	9125	19750	28625	40250	50750	58750
58	0	0	0	2400	7300	16050	23950	35225	46750	56875

Note: Data are estimated for ages prior to 25 from data for the 15-24 age group.

Table A11 Median Employment Incomes, by Deciles, College Graduates, Ontario, Males, 1990

AGE	DECILE1	DECILE2	DECILE3	DECILE4	DECILE5	DECILE6	DECILE7	DECILE8	DECILE9	DECILE10
21	125	3750	3750	7500	10000	12500	15000	20000	25000	30000
22	125	3750	5000	10000	12500	15000	17500	23750	27500	32500
23	125	5000	8750	12500	15000	17500	20000	27500	32500	36250
24	125	6250	12500	15000	17500	20000	22500	30000	35000	40000
25	167	7083	13750	16708	19958	22500	25917	33292	37500	43208
26	208	7917	15000	18417	22417	25000	29333	36583	40000	46417
27	250	8750	16250	20125	24875	27500	32750	39875	42500	49625
28	500	9725	17150	21475	26200	29400	34400	40525	43725	52100
29	750	10700	18050	22825	27525	31300	36050	41175	44950	54575
30	1000	11675	18950	24175	28850	33200	37700	41825	46175	57050
31	1250	12650	19850	25525	30175	35100	39350	42475	47400	59525
32	1500	13625	20750	26875	31500	37000	41000	43125	48625	62000
33	1725	14350	21750	27750	32300	37475	41825	44250	50500	64175
34	1950	15075	22750	28625	33100	37950	42650	45375	52375	66350
35	2175	15800	23750	29500	33900	38425	43475	46500	54250	68525
36	2400	16525	24750	30375	34700	38900	44300	47625	56125	70700
37	2625	17250	25750	31250	35500	39375	45125	48750	58000	72875
38	2550	17575	26350	31975	36225	40200	45600	49800	59675	75550
39	2475	17900	26950	32700	36950	41025	46075	50850	61350	78225
40	2400	18225	27550	33425	37675	41850	46550	51900	63025	80900
41	2325	18550	28150	34150	38400	42675	47025	52950	64700	83575
42	2250	18875	28750	34875	39125	43500	47500	54000	66375	86250
43	2000	18600	28925	35225	39625	44075	47950	54800	67250	87275
44	1750	18325	29100	35575	40125	44650	48400	55600	68125	88300
45	1500	18050	29275	35925	40625	45225	48850	56400	69000	89325
46	1250	17775	29450	36275	41125	45800	49300	57200	69875	90350
47	1000	17500	29625	36625	41625	46375	49750	58000	70750	91375
48	950	17050	29175	35925	41225	46050	49475	57900	71275	91200
49	900	16600	28725	35225	40825	45725	49200	57800	71800	91025
50	850	16150	28275	34525	40425	45400	48925	57700	72325	90850
51	800	15700	27825	33825	40025	45075	48650	57600	72850	90675
52	750	15250	27375	33125	39625	44750	48375	57500	73375	90500
53	600	13000	25425	31925	38600	43800	47675	57025	72825	89825
54	450	10750	23475	30725	37575	42850	46975	56550	72275	89150
55	300	8500	21525	29525	36550	41900	46275	56075	71725	88475
56	150	6250	19575	28325	35525	40950	45575	55600	71175	87800
57	0	4000	17625	27125	34500	40000	44875	55125	70625	87125
58	0	3200	14300	23175	31325	37500	42650	52850	67475	86150

Note: Data are estimated for ages prior to 25 from data for the 15-24 age group.

Table A12 Median Employment Incomes, by Deciles, College Graduates, Ontario, Females, 1990

AGE	DECILE1	DECILE2	DECILE3	DECILE4	DECILE5	DECILE6	DECILE7	DECILE8	DECILE9	DECILE10
21	0	0	0	0	0	6250	8750	13750	15000	20000
22	0	0	625	2500	5000	8750	11250	16250	20000	26250
23	0	0	1250	3750	7500	11250	13750	18750	22500	30000
24	0	500	2500	5000	10000	13750	16250	21250	25000	33750
25	0	583	2833	5750	10792	14625	17667	22292	26000	34917
26	0	667	3167	6500	11583	15500	19083	23333	27000	36083
27	0	750	3500	7250	12375	16375	20500	24375	28000	37250
28	0	600	3000	6925	12150	16325	20675	24850	28625	37900
29	0	450	2500	6600	11925	16275	20850	25325	29250	38550
30	0	300	2000	6275	11700	16225	21025	25800	29875	39200
31	0	150	1500	5950	11475	16175	21200	26275	30500	39850
32	0	0	1000	5625	11250	16125	21375	26750	31125	40500
33	0	0	825	5475	11100	16050	21275	26500	31750	42150
34	0	0	650	5325	10950	15975	21175	26250	32375	43800
35	0	0	475	5175	10800	15900	21075	26000	33000	45450
36	0	0	300	5025	10650	15825	20975	25750	33625	47100
37	0	0	125	4875	10500	15750	20875	25500	34250	48750
38	0	0	1025	5750	11450	16650	21800	26400	34700	49075
39	0	0	1925	6625	12400	17550	22725	27300	35150	49400
40	0	0	2825	7500	13350	18450	23650	28200	35600	49725
41	0	0	3725	8375	14300	19350	24575	29100	36050	50050
42	0	0	4625	9250	15250	20250	25500	30000	36500	50375
43	0	25	4000	8800	14700	19900	25125	29700	36175	49550
44	0	50	3375	8350	14150	19550	24750	29400	35850	48725
45	0	75	2750	7900	13600	19200	24375	29100	35525	47900
46	0	100	2125	7450	13050	18850	24000	28800	35200	47075
47	0	125	1500	7000	12500	18500	23625	28500	34875	46250
48	0	100	1350	6325	11900	17775	23425	28375	34675	45650
49	0	75	1200	5650	11300	17050	23225	28250	34475	45050
50	0	50	1050	4975	10700	16325	23025	28125	34275	44450
51	0	25	900	4300	10100	15600	22825	28000	34075	43850
52	0	0	750	3625	9500	14875	22625	27875	33875	43250
53	0	0	600	3025	8375	13900	21525	27200	33350	42800
54	0	0	450	2425	7250	12925	20425	26525	32825	42350
55	0	0	300	1825	6125	11950	19325	25850	32300	41900
56	0	0	150	1225	5000	10975	18225	25175	31775	41450
57	0	0	0	625	3875	10000	17125	24500	31250	41000
58	0	0	0	500	3100	9050	15875	22700	29600	39600

Note: Data are estimated for ages prior to 25 from data for the 15-24 age group.

APPENDIX B: Default Values and Options for UNIV Program

```
SIMULATION MODEL FOR
CONTINGENT REPAYMENT STUDENT ASSISTANCE PLANS
by
David Stager and Dan Derkach
University of Toronto, 1992

Display default values? (y/n)y

Student interest rate = 0.01
Fund interest rate = 0.03
Rate of growth in real income = 0
Income threshold = $20117.99
Maximum payment period = 25 years
Income brackets and payment scales
        Brackets              Scale
 20117.99   -   29999.99      0.0200
 30000.00   -   39999.99      0.0250
 40000.00   -   49999.99      0.0300
 50000.00   -   59999.99      0.0350
 60000.00   -   69999.99      0.0400
 70000.00   -   79999.99      0.0450

Student advances
Undergraduate programs $1770
Engineering $1920
Medicine $2250
Graduate programs $0

Next page ? (y/n)y

Student enrolment (male / female)
Arts and Science
1st year dropouts: 1525 / 2010
2nd year dropouts: 2059 / 2714
3rd year graduates: 6441 / 8750
4th year graduates: 3080 / 5024
Other programs
1st year dropouts: 655 / 768
2nd year dropouts: 885 / 1037
4th year graduates: 5015 / 5877
Engineering
1st year dropouts: 357 / 71
2nd year dropouts: 482 / 96
4th year graduates: 2730 / 543
Law
Graduates: 499 / 449
Medicine
Graduates: 431 / 344
Masters
Graduates: 789 / 526
Doctorate
2nd year dropouts: 127 / 85
Graduates: 298 / 198
```

```
Do you want to alter starting values? (y/n)y

Do you want to alter interest rates? (y/n)y

Student rate = 0.01  New rate = 1.2

Value out of bounds (1.2) -- reset to 0.1
Fund rate = 0.03  New rate = .3

Value out of bounds (0.3) -- reset to 0.1
Do you want to alter rate of real income growth? (y/n)y

Growth rate = 0  New rate = .5

Value out of bounds (0.5) -- reset to 0.1
Do you want to alter payment threshold? (y/n)y

Income threshold = $20118  New threshold = $1000000

Value out of bounds (1e+06) -- reset to 40000
Do you want to alter payment period? (y/n)y

Payment period = 25  New period = 40

Value out of bounds (40) -- reset to 35
Do you want to alter payment rates? (y/n)y

Bracket                          Rate
1   20117.99 - 29999.99          0.0200
2   30000.00 - 39999.99          0.0250
3   40000.00 - 49999.99          0.0300
4   50000.00 - 59999.99          0.0350
5   60000.00 - 69999.99          0.0400
6   70000.00 - 79999.99          0.0450

New rate for bracket 1 = .02

New rate for bracket 2 = .025

New rate for bracket 3 = .030

New rate for bracket 4 = .035

New rate for bracket 5 = .040

New rate for bracket 6 = .045

Do you want to alter advances? (y/n)y

Undergraduate = $1770  New advance = $-2222

Value out of bounds (-2222) -- reset to 0
```

Engineering = $1920 New advance = $15000

Value out of bounds (15000) -- reset to 10000
Medicine = $2250 New advance = $5000

Graduate = $0 New advance = $2000

Do you want to alter enrolments? (y/n)y

Arts & Science
Male 1st year dropouts = 1525 New value = 0

Female 1st year dropouts = 2010 New value = 99999

Male 2nd year dropouts = 2059 New value = 100500

Value out of bounds (100500) -- reset to 100000
Female 2nd year dropouts = 2714 New value = o

Input must be floating point -- reenter:

555

Male 3 year graduates = 6441 New value = 6441

Female 3 year graduates = 8750 New value = 8750

Male 4 year graduates = 3080 New value = 3080

Female 4 year graduates = 5024 New value = 5024

Other Programs
Male 1st year dropouts = 655 New value = 655

Female 1st year dropouts = 768 New value = 768

Male 2nd year dropouts = 885 New value = 885

Female 2nd year dropouts = 1037 New value = 1037

Male 4 year graduates = 5015 New value = 5015

Female 4 year graduates = 5877 New value =

Engineering
Male 1st year dropouts = 357 New value = 357

Female 1st year dropouts = 71 New value = 71

Male 2nd year dropouts = 482 New value = 482

Female 2nd year dropouts = 96 New value = 96

Male 4 year graduates = 2730 New value = 2730

Female 4 year graduates = 543 New value = 543

Law
Male graduates = 499 New value = 499

Female graduates = 449 New value = 449

Medicine
Male graduates = 431 New value = 431

Female graduates = 344 New value = 344

Masters
Male graduates = 789 New value = 789

Female graduates = 526 New value = 526

Doctorate
Male 2nd year dropouts = 127 New value = 127

Female 2nd year dropouts = 85 New value = 85

Male graduates = 298 New value = 298

Female graduates = 198 New value = 198

Do you want another cohort (1 entered, 31 remain)? (y/n)

Re-enter (must be 'y' or 'n'):n

C:\>

[or alternatively, answer 'y' to enter more cohorts]

Do you want another cohort (1 entered, 31 remain)? (y/n)y

Do you want to run successive cohorts (31 maximum)? (y/n)y

How many successive cohorts?31

Do you want to alter starting values? (y/n)y